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Scorpions of Baja California, Mexico, and Adjacent Islands

By

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Abstract

Williams, Stanley C. Scorpions of Baja California, Mexico, and adjacent islands. *Occasional Papers of the California Academy of Sciences*, no. 135, 127 pages, 113 figs., 7 tables, 1980.—The scorpion fauna of the Baja California peninsula and associated islands is composed of 61 species belonging to 4 families and 11 genera. Twelve subspecies are recognized. Twelve new species of *Vaejovis* (*V. pattersoni, V. adcocki, V. armadentis, V. bechteli, V. dwyeri, V. gigantaensis, V. haradoni, V. hearnei, V. janssi, V. littoralis, V. pacificus, V. peninsularis*) and one new *Paruroctonus* (*P. surensis*) are described. One new genus, *Paravaejovis*, is described in the Vaejovidae. The vaejovid genus *Serradigitus* Stahnke is considered a junior synonym of *Vaejovis* Koch. The name *Vaejovis montcazieri* is proposed to replace the junior homonym *Vaejovis cazieri* (Gertsch & Soleglad). Keys to identification, diagnoses, illustrations, distributional maps, and type data are given for each species and subspecies known from Baja California. The scorpion fauna of Baja California is one of the richest ones in numbers of genera, species, and families of any place of comparable size in the world. It is rich in endemics with 4 endemic genera and 46 endemic species. The faunal richness is related to the complex geological history of the peninsula which resulted in a diversity of habitats and to changing evolutionary and zoogeographic pressures. Today the scorpion fauna is distributed among a multitude of habitat types within 8 biotic provinces.

Scorpions of Baja California, Mexico, and Adjacent Islands

Stanley C. Williams*

INTRODUCTION

The scorpion fauna of Baja California and adjacent islands is one of the richest and most diverse in the world. Apparently no other area of comparable size has as many families, genera, and species represented. This diversity is explained by the complex geological history of the region, variety of habitats available to scorpions, and multiple origins of the fauna.

Knowledge of the scorpion fauna of Baja California has developed slowly. In a short paper in 1863, H. C. Wood described eight species of scorpions, including some of the first known from North America—six of these were from Baja California. The taxonomic status of several of Wood's species remained uncertain until now. Banks (1910) erroneously included three of Wood's endemic Baja California species in his work on the California scorpions. Ewing (1928) made similar errors which have been perpetuated to this day.

Gertsch's (1958) study of scorpions collected by the Puritan-American Museum Expedition and augmented by other material that had accumulated in the American Museum of Natural History was the first major work on scorpions of Baja California. Gertsch discussed 16 species, 3 of which were new. His study more than doubled the number of species then known from the region. Since Gertsch's work, little was added to the knowledge of the scorpions from Baja California. In 1968 the present study was initiated. Three major collecting expeditions were undertaken on the peninsula and four to associated islands to sample the scorpion fauna. Approximately 60,000 specimens were examined during the course of this study—they represent 4 families, 11 genera, 61 species, and 12 subspecies. One genus and 13 species are herein described as new.

The primary purposes of this study are to: (1) clarify the taxonomic status of the scorpions of Baja California and associated islands; (2) describe their geographic distributions; (3) evaluate and compare the scorpion fauna of Baja California with those of other areas; and (4) provide descriptions, diagnoses, illustrations, and keys for scorpion identification.

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MEASUREMENTS AND TERMINOLOGY

The measurements and morphological terminology (Fig. 1) given in this paper are generally standard ones used in scorpion systematics. The main exception is the orientation of the pedipalp chela during measurement. Measurements were made to the nearest 0.1 mm with a microscope and a calibrated eyepiece micrometer except for total body length which was measured with a millimeter ruler. The width of the pedipalp palm is measured with the fingers held vertically; the depth is measured with fingers held horizontally. Movable-finger width is the widest dimension of the pedipalp movable finger as measured ventrally across the finger articulation. The scallops or open spaces of the pedipalp chela are viewed along or between the opposing surfaces of the fingers from a retrolateral perspective. The length and width of the humerus and the brachium are measured from dorsal perspective with these segments held horizontally. Total metasomal length is the sum of the five separate metasomal-segment lengths (each measured separately) and does not include the telson. Pectine tooth counts are given as the numbers of teeth in one comb, unless a referenced specimen has unequal numbers in the two combs, in which case both counts are given. All measurements are taken from dorsal perspective, unless otherwise stated.

Mesosomal segments are numbered consecutively 1 to 7, from anterior to posterior. Metasomal segments are numbered consecutively I to V, from anterior to posterior. Supernumerary granules are numbered consecutively on the pedipalp fingers from distal to proximal. Primary-row denticles of pedipalp fingers are reported as total number or number per specified subrow. When primary-row denticles are subdivided into subrows, the resulting subrows are numbered consecutively from distal to proximal.

To determine the variability of quantitative characters, such as ratios between body parts, or of pectine tooth counts, a series of 20 mature individuals (half males) were measured and analyzed.

KEY TO THE FAMILIES AND GENERA OF BAJA CALIFORNIA SCORPIONS

1. Pedipalp fingers with numerous supernumerary granules flanking both sides of primary-row denticles (Fig. 2*C*); sternum of prosoma distinctly narrowed anteriorly, shaped like an isosceles triangle (Fig. 2*B*) ..... Buthidae, genus *Centruroides*

Pedipalp fingers completely lacking supernumerary granules on retrolateral side of primary-row denticles (Figs. 6*C*, 54); sternum of prosoma not triangular, but essentially pentagonal (similar to Figs. 51*D*, *E*) 2

2(1). Telson with large distinct subaculear tubercule (Figs. 9*G*, *H*); only one pedal spur at origin of last tarsal segment on hind walking legs ..... Diplocentridae, genus *Didymocentrus*

Telson without subaculear tubercule or tubercule, if present, generally not readily detectable to unaided eye (Figs. 57*A–F*); two pedal spurs at origin of last tarsal segment of hind walking legs (Figs. 19*A*; 110*C*) 3

3(2). Pedipalp fingers with primary-row denticles subdivided into five or six nonoverlapping, oblique subrows (Fig. 6*C*); two ocelli at each anterolateral corner of carapace (Fig. 5*D*) ..... Chactidae, genus *Superstitionia*

Pedipalp fingers with primary-row denticles not subdivided into oblique subrows, but present as a single, continuous row (Figs. 16*C*, 19*B*), usually with three or four ocelli at each anterolateral corner of carapace (occasionally with two such ocelli) (Figs. 14*A–B*, 51*A–B*) ..... Vaejovidae 4

4(3). Metasoma with single, unpaired, ventromedian keel on segments III and IV (Figs. 108*B*, 110*F*) 5

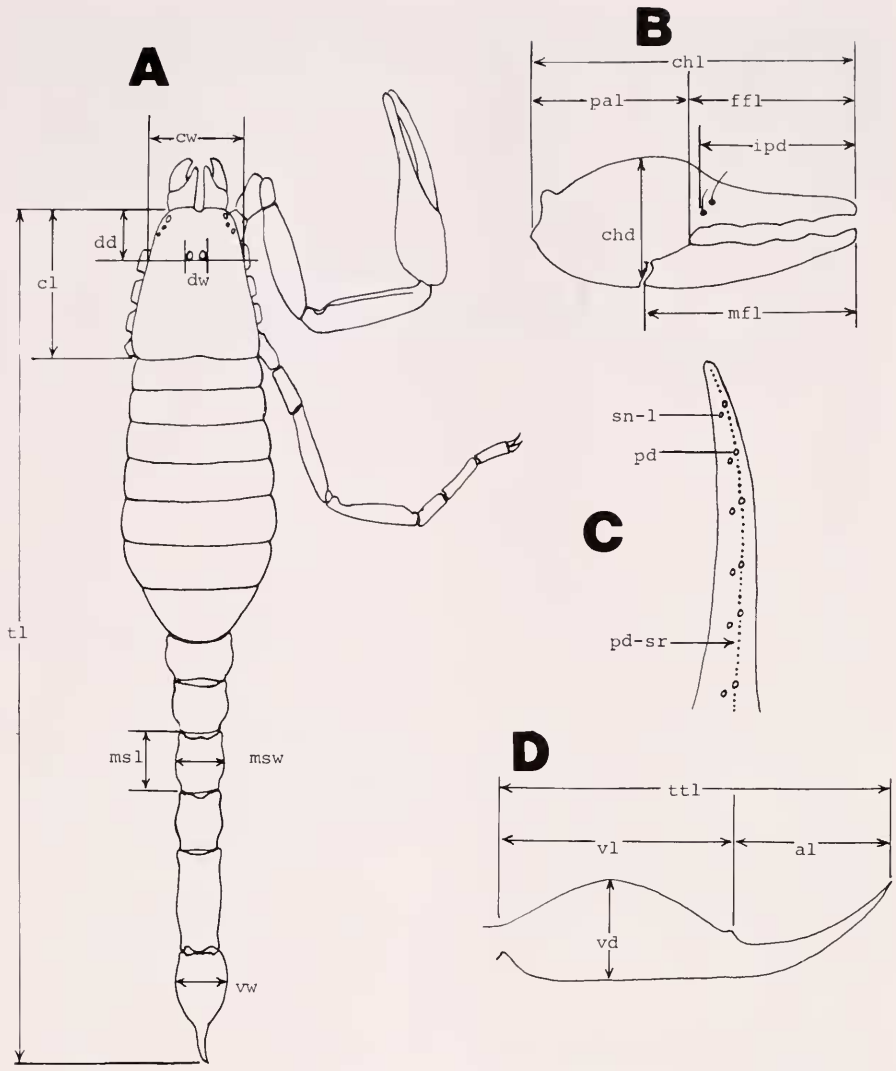

FIGURE 1. Scorpion measurement orientation. (*A.*) Dorsal view: *cl*, carapace length; *cw*, carapace width; *dd*, distance between median ocelli and frontal margin of carapace; *dw*, diameter of median ocular diad; *msl*, metasomal-segment length (segment III); *msw*, metasomal-segment width (segment III); *tl*, total body length. (*B.*) Pedipalp chela: *chd*, chela palm depth; *chl*, chela total length; *ffl*, fixed finger length; *ipd*, inner proximal trichobothrium distance (distance from inner proximal trichobothrium of fixed finger to terminus of finger); *mfl*, movable-finger length; *pal*, palm length. (*C.*) Pedipalp finger: *pd*, primary-row denticle (enlarged denticle marking end of second subrow); *pd-sr*, sixth subrow of primary denticles (subrows numbered consecutively from distal to proximal); *sn-1*, supernumerary denticle number 1 (numbered consecutively from distal to proximal). (*D.*) Telson: *al*, aculeus length; *ttl*, total telson length; *vl*, vesicle length; *vd*, vesicle depth.

Metasoma with ventromedian keels of segments III and IV paired or obsolete 6

5(4). Fixed finger of pedipalp much shorter than carapace length; fixed pedipalp finger with eight supernumerary granules ..... genus *Vejovoidus*

Fixed finger of pedipalp as long as or much longer than carapace length; fixed pedipalp finger with six supernumerary granules ..... genus *Syntropis*

6(4). Ventral margin of movable cheliceral finger with one long, dark, conspicuous tooth (Fig. 19*E*) ..... genus *Hadrurus*

Ventral margin of movable cheliceral finger

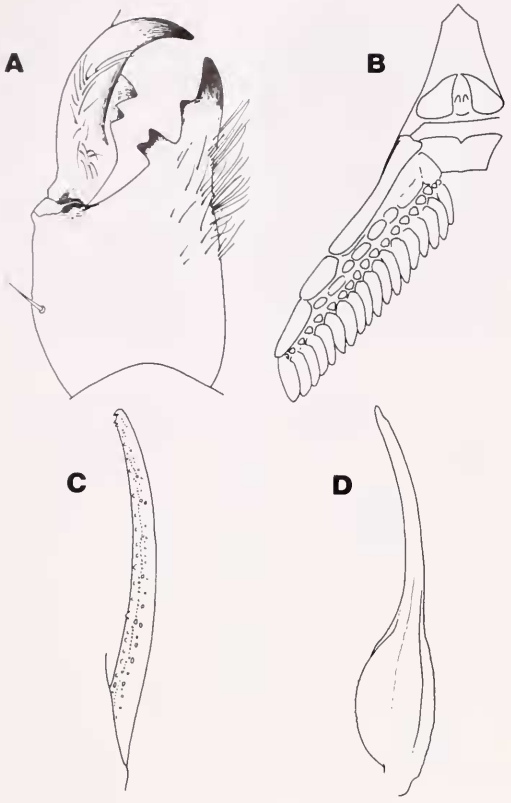

FIGURE 2. Structural characteristics of *Centruroides exilicauda*. (*A*.) Ventral view of chelicera. (*B*.) Pectine of male showing genital operculum, genital papillae and prosomal sternum (note triangular sternum). (*C*.) Movable finger of pedipalp showing primary-row denticles flanked medially and laterally by numerous supernumerary granules. (*D*.) Pedipalp chela, dorsal view.

with small teeth, minor denticles, denticlelike crenulations, or completely lacking denticles (Figs. 52*A*, 109*A*) 7

7(6). Pedipalp brachium with six trichobothria on ventral surface (Fig. 29*D*); openings to book lungs circular (Fig. 29*F*) ..... genus *Nullibrotheas*

Pedipalp brachium not with six trichobothria on ventral surface, these either less or more than six (Figs. 15*C*, 52*B*); openings to book lungs not circular, but elongate (Fig. 52*C*) 8

8(7). Metasoma with ventromedian and ventrolateral keels well developed and crenulate on segments III and V, but these keels completely obsolete on segment IV (Fig. 14*C*); pedipalp brachium with more than three trichobothria on ventral surface (Fig. 15*C*) ..... genus *Anuroctonus*

Metasoma with ventromedian and ventrolateral keels not less developed on segment IV than on segment III; pedipalp brachium with two trichobothria on ventral surface (Fig. 52*B*) 9

9(8). Ventral surface of pedipalp palm with conspicuous curved row of about 14 or 15 trichobothria originating near movable-finger base and terminating on posterior retrolateral aspect of palm (Fig. 32*B*); pedipalp chela with total of 34 trichobothria ..... *Paravaejovis* Williams, new genus

Pedipalp with series of 10 or less trichobothria forming an irregular row which originates near movable-finger base and terminates on posterior retrolateral aspect of palm; pedipalp chela with total of 28 or less trichobothria (usually 26 trichobothria) 10

10(9). Metasoma with dorsal and dorsolateral keels of segments III and IV terminating posteriorly in more or less sharp or angular denticle or spine; chelicera with ventral margin of movable finger smooth and generally lacking denticles (Fig. 52*A*) ..... genus *Vaejovis*

Metasoma with dorsal and dorsolateral keels of segments III and IV with rounded posterior terminations (Fig. 37*A*); chelicera with ventral margin of movable finger generally armed with one to several small denticles or crenulations (Fig. 36*D*) ..... genus *Paruroctonus*

FAMILY BUTHIDAE

Genus **Centruroides** Marx

(Figure 2)

Centruroides is distinguished from other genera in Baja California as follows: sternum of prosoma distinctly narrowed anteriorly, shaped like an isosceles triangle; pedipalp fingers with numerous supernumerary granules flanking primary-row denticles along both sides; pedipalp fingers with primary-row denticles subdivided into oblique subrows. *Centruroides*, represented by one species, is the only Buthidae in Baja California.

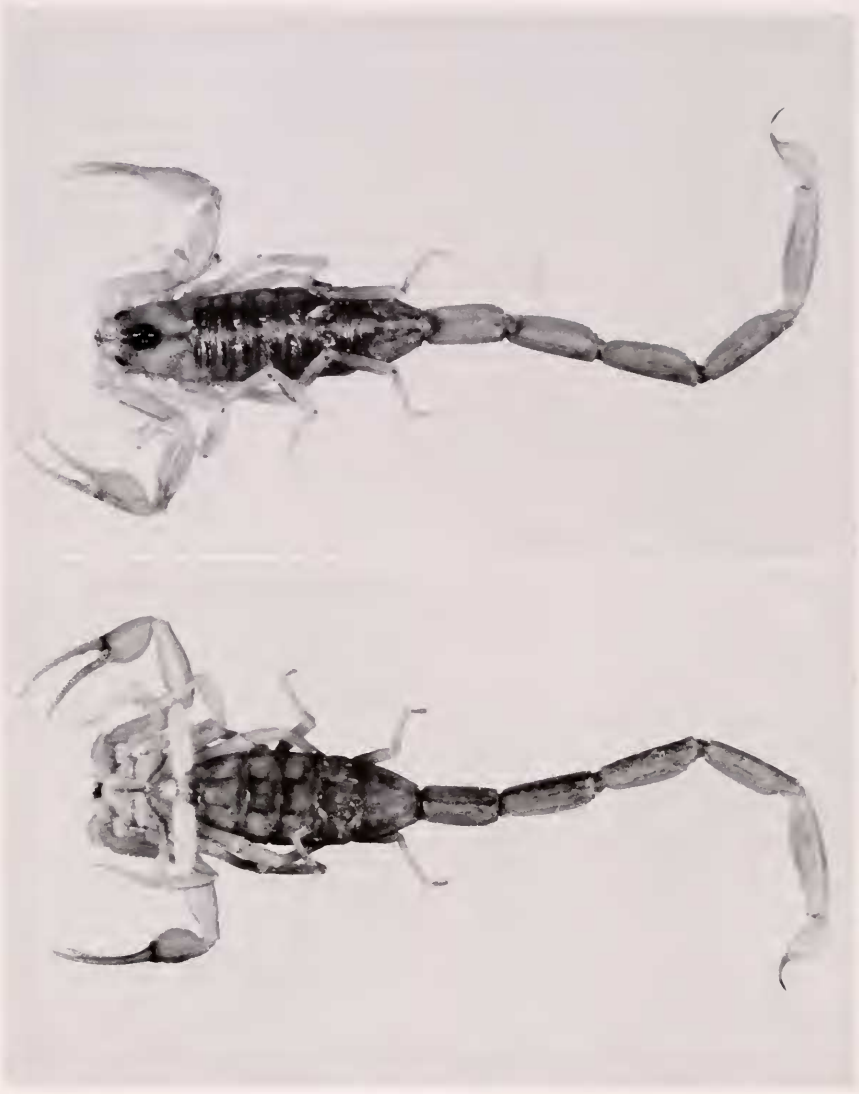

FIGURE 3. *Centruroides exilicauda*, male, dorsal and ventral views, from Cabo San Lucas. Note elongate metasoma, reduced to obsolete subaculear tubercule, faint dusky marking in interocular triangle, and dusky marbling of ventral surface of metasoma.

Centruroides exilicauda (Wood)

(Figures 2–4: 112, 113)

Buthus exilicauda WOOD, 1863a:107–108; 1863b:366–367.
Centrurus exilicauda (Wood). MARX 1887:91. BANKS 1900:425; 1910:188, 190.
Centruroides exilicauda (Wood). EWING 1928:18. HOFFMANN 1932:349–352. GERTSCH 1958:18. DIAZ-NAJERA 1964:21.
Centruroides sculpturatus EWING, 1928:20–21. WILLIAMS AND HADLEY 1967:106–107. STAHNKE 1971:284–307. JOHNSON AND ALLRED 1972:161.
Centruroides gertschi STAHNKE, 1940:101–103.
Centruroides pallidiceps POCOCK [part]. GERTSCH 1958:18.
Centruroides zweifeli GERTSCH, 1958:18–20.

DIAGNOSIS.—Base color of body pale to golden-yellow (completely dusky races in some volcanic habitats); with or without one pair dusky to dark longitudinal stripes on mesosomal dorsum; interocular region with or without dusky triangular marking; space between ventromedian keels of metasoma generally with more or less distinct dusky pigmentation. Pectine teeth 18–21 in females, 19–31 in males; pectine basal plate of female lacking deep pit, sometimes with broad shallow depression. Metasoma with keels

distinctly developed and crenular; each segment longer than wide. Telson with elongate, well-curved aculeus; subaculear tubercule absent or reduced in most mature individuals, more developed in juveniles. Pedipalps with elongate slender chela; opposing surfaces of fingers with 8 nonoverlapping, oblique subrows of denticles in primary row, these flanked prolaterally and retrolaterally with numerous supernumerary granules.

TYPE DATA.—*Buthus exilicauda* Wood, seven cotypes: USNM, S-7, S-8 (Jar 3); Mexico, "Lower California."

Centruroides sculpturatus Ewing, cotypes: USNM, S-12, S-13 (Jar 5); Arizona: Maricopa Co., Tempe, 29–III and 1–IV–1927, H. E. Ewing.

Centruroides gertschi Stahnke, cotypes: H. L. Stahnke collection; Arizona: Bisbee, Clifton, Mesa, Nogales, Thatcher, Warren.

DISTRIBUTION.—La Misión to Cabo San Lucas, and on most associated islands; Sonora; SE California; Arizona; SW New Mexico.

NEW RECORDS.—**Baja California Norte, Mexico:** La Misión, 14–VII–1969 (Williams, Lee); 6.4 km NNE El Sauzal, 15–VII–1969 (Williams, Lee); 3.2 km N Ensenada, 15–VII–1969 (Williams, Lee); Punta Banda, 4–IV–1969 (Williams); 8.0 km N San Antonio del Mar (SDMNH); 19 km SE Maneadero, 19–IV–1965 (Cavagnaro, Ross, Vesterby); 5.6 km N Arroyo Santo Tomás, 22–II–1958 (Sleeper); 2.6 km N Punta Calaveras, Hematite Mine, 13–VII–1962 (Parrish); Río San Ysidro, 25–III–1956 (Wood, SDMNH); 6.4 km W Arroyo Seco, 14–VII–1962 (Parrish); 3.2 km S Eréndira, 22–VI–1967 (Philipps Jr.); Valle Trinidad, 14–III–1936 (SDMNH); 11.2 km W San Martías Pass, Valle de la Trinidad, 16–IV–1960 (Sleeper); 24 km E San Telmo de Arriba, 13–VII–1969 (Williams, Lee); 11.2 km E Meling Ranch, Sierra San Pedro Mártir, 13–VII–1969 (Williams, Lee); San Quintín, 24–XI–1962 (Craig, Dailey); Isla San Martín, 23–XII–1971 (Sloan); 19 km N El Rosario, 9–I–1965 (Roth, AMNH); 13 km SE El Rosario, 7–IV–1969 (Williams); 3.2 km NW summit of Aguajito Grade, 7–IV–1969 (Williams); summit of Aguajito Grade, 7–IV–1969 (Williams); Socorro, 25–III–1973; El Arenoso, 20–I–1960 (Soule); 21 km S El Mármol, 12–I–1965 (Roth, AMNH); 0.8 km S La Virgen, 8–IV–1969 (Williams); 4.8 km N Santa María, 12–VII–1969 (Williams, Lee); Calamajué Arroyo, 15–VI–1968 (Williams, Cazier); 61 km N Laguna Chapala, 9–IV–1969 (Williams); Bahía de los Ángeles, 17–VI–1968 (Williams, Cazier); 27 km N Punta Prieta, 2–IX–1962 (Harbison, SDMNH); 10 km SW Misión San Borja, Rancho Ignacito, 17–I–1965 (AMNH); Marmolito Onyx Mine, 27–XII–1960 (Parrish); 1.6 km N Miller's Landing, 24–II–1966 (Roth, AMNH); Isla Cedros, SE side, 28–I–1963 (Lindsay); 18 km N Rancho Mezquital, 15–IV–1969 (Williams); 55 km NNW Manuela, 22–VI–1968 (Williams, Cazier).

Baja California Sur: 3.2 km E Las Bombas, 16–IV–1969 (Williams); 3.2 km S Los Ángeles, 19–III–1951 (Brattstrom, Harvey, SDMNH); 6.4 km S El Arco, 17–IV–1969 (Williams); Punta Trinidad, arroyo S saline lake, 20–21–III–1971 (Lee); Bahía de los Ángeles village, 8–III–1962 (Smith); Turtle Bay, 2–XI–1925 (Keifer); La Laguna, Sierra Laguna, 26–V–1965 (Banks, Sloan, SDMNH); 5 km S Rancho Tablón, 23–VI–1968 (Williams, Cazier); 1.6 km S El Caracol, 2–IV–1961 (Smith); 32 km S Santa Rosalía, 19–IV–1969 (Williams); San Ignacio, 24–VI–1968 (Williams, Cazier); 21 km W San Ignacio, San Ángel, 27–VI–1968 (Williams, Cazier); Tortuga Island, 30–III–1962 (Harbison, SDMNH); Isla San Marcos, SW end, 19–III–1971 (Lee); 44.4 km S Mulegé, near El Requesón, 23, 26–XII–1973 (Johnson); Posada Concepción Trailer Park, 22–XII–1973 (Johnson); 13 km NW San Raymundo, 30–VI–1968 (Williams, Cazier); 1.6 km SW Rancho Canipolé, 15–V–1969 (Williams); 6.4 km W La Purísima, 1–VII–1968 (Williams, Cazier); Puerto Santispac, Bahía Concepción, 1–IV–1962 (Belvedere Expedition); San José de Comondú Canyon, 15–II–1966 (Roth, AMNH); 8.0 km SW San Miguel Comondú, 2–VII–1968 (Williams, Cazier); Isla Coronados, SW end, 25–V–1970 (Williams, Lee); 13 km S Loreto, base of La Giganta, 27–I–1965 (Roth, AMNH); 3.5 km W Rancho Las Parras, 26–V–1970 (Williams, Lee); 6.4 km NW San Jávier, 15–IV–1969 (Williams); 27 km S Loreto, Puerto Escondido, 27–V–1970 (Williams, Lee); Isla Carmen, Puerto Balandra, 4–IV–1962 (Belvedere Expedition); Isla Danzante, 7–IV–1962 (Belvedere Expedition); Isla Monserrate, 8–IV–1962 (Belvedere Expedition); Isla Santa Catalina, SW end, 26–IV–1964 (Sloan); Isla Santa Cruz, SW side, 18–IV–1962 (Soule); Misión Dolores, 11–VIII–1965 (Herald); 27 km N Colonia de la Toba, 30–I–1965 (Roth, AMNH); 24 km ESE El Crucero, Las Lagunitas, 14–II–1966 (Roth, AMNH); 51 km S Villa Constitución, 30–I–1965 (Roth, AMNH); 8.0 km W Misión San Luis Gonzaga, 14–II–1966 (Roth, AMNH); Las Ánimas Island, 8–IV–1971; Isla San Francisco, S end, 17–IV–1962 (Banks); Santa Rita, 27–VII–1968 (Williams, Bentzien, Bigelow); Isla Partida, S shore, 8–VII–1968 (Fox, Bentzien); Espíritu Santo Island, 4–VIII–1971 (Lucas); Isla Ballena, 21–IV–1962 (Parrish); Isla Ildefonso, 2–IV–1962 (Belvedere Expedition); Isla Coyote, 19–IV–1962 (Wiggins); West Galera Island, 23–VI–1964 (Parrish); 3.2 km E Pichilingue, 25–XI–1973 (Williams, Mullinex); 16 km W La Paz, Los Aripes, 6–VII–1968 (Williams, Cazier); 7.2 km S La Paz, 6–I–1959 (Wiggins); 0.5 km N La Paz airport, 13–VII–1968 (Williams, Cazier); La Paz, 11–VII–1968 (Cazier, Bigelow); 8.0 km SW Las Cruces, 30–VII–1968 (Williams, Cazier, Bentzien, Bigelow); 11 km NW San Antonio, 24–VII–1968 (Williams, Bentzien); El Triunfo, 3–II–1965 (Roth); 4.0 km E San Bartolo, 24–VII–1968 (Williams, Bentzien); 0.5 km S Rancho Buena Vista, 6–V–1969 (Williams); Bahía de las Palmas, 15–XI–1961 (Cary-Carnegie Expedition, CM); La Ribera, 10–II–1966 (Roth, AMNH); Los Muertos Bay, 16–VIII–1965 (Lucas); Isla Cerralvo, Bahía Limona, 31–V–1969; 8.9 km N Santiago, Las Cuevas, 16–VII–1968 (Cazier); Todos Santos, 4–II–1966 (Roth, AMNH); 5.6 km S El Pescadero, 23–VII–1968 (Williams, Cazier); 6.4 km W El Refugio, 13–II–1966 (Roth, AMNH); 5 km S Colonia Calles, 5–II–1966 (Roth, AMNH); Boca de la Sierra, 6–III–1969 (Snelling, LACM); Punto Pulmo, 2–VII–1973 (Williams, Blair); Cerro Cuevoso, Cabo Pulmo, 26–III–1947 (La Rivers); Bahía de los Frailes, 10–IV–1947 (La Rivers, UCB); 39 km N Miraflores, 10–II–1966 (Roth, AMNH); 6.4 km N Tinaja, 23–VII–1968 (Williams, Fox, Bentzien); 3.2 km N Los Pozos, 23–VII–1968 (Williams, Fox, Bentzien); 27 km N San José del Cabo, 9–II–1966 (Roth, AMNH); 1.6 km E Migriño, 19–VII–1971 (Real); 2.4 km NE Punta Palmilla, 16–VII–1968 (Williams, Cazier); Puerto Chileno, 26–XI–1961 (Cary-Carnegie Expedition, CM); 26.6 km NW Cabo San Lucas, 23–VII–1968 (Williams, Fox, Bentzien).

FIGURE 4. Distribution of *Centruroides exilicauda*.

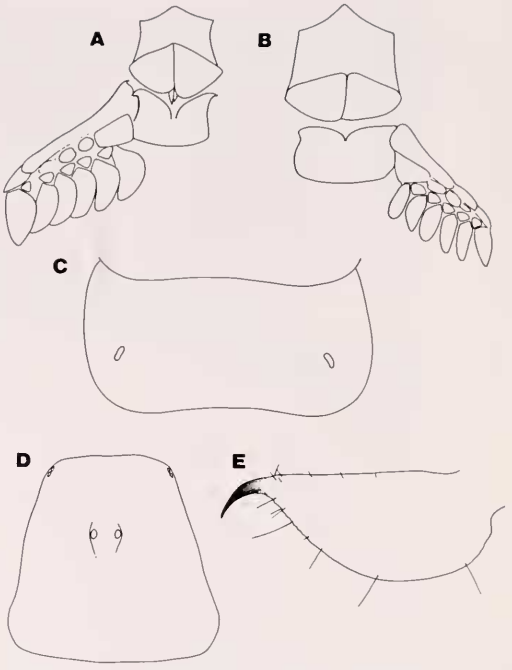

FIGURE 5. *Superstitionia donensis*. (*A.*) Prosomal sternum, genital operculum, genital papillae, and pectine (male). (*B.*) Pectines, genital operculum and prosomal sternum (female). (*C.*) Mesosomal sternum showing oval stigma. (*D.*) Carapace showing median and lateral ocelli (note two pairs of lateral ocelli). (*E.*) Telson of male.

Sonora: Turners Island, 25–IV–1966 (Lucas); Isla San Esteban, 2–IV–1953 (Arnaud); Tiburón Island, 23–IV–1966 (Lucas); Cholla Bay, 15, 16–X–1966 (CAS).

REMARKS.—*Centruroides exilicauda* is one of the most variable and widespread species in Baja California. It occurs widely on the peninsula and on most of the associated islands. In the Cabo San Lucas region, color dimorphism is shown with a pale, concolorous form and another characterized by one pair of dusky longitudinal stripes on the mesosomal dorsum. Females of the Cape region have been collected bearing both color forms as second instars. Numerous local races have developed throughout the range. There is an all-dark one on the islands of San Martín and Tortugas, an apparent adaptation to the dark substratum of volcanic islands. The islands of Espíritu Santo, Cerralvo, and Partida, have produced populations with strikingly large bodies. Gigantism is also found in the Balandra Cove region on the peninsula near La Paz. Populations along the Gulf of California coast tend to be lighter in coloration than those found along the Pacific coast. Some characters vary from north to south, such as the pectine tooth count—lower at Cabo San Lucas than in the more northern parts of the range, though such differences seem to intergrade. Walker (1973) recently analyzed geographic variation in *Centruroides exilicauda*.

Comparison of *Centruroides exilicauda* from Baja California with *Centruroides sculpturatus* from Tempe, Arizona, reveal insignificant differences in morphology. Minor differences do appear when widely separated populations are compared; however, these seem to reflect only local racial adaptations. I therefore consider *Centruroides sculpturatus* as a junior synonym and representative of a northern population of *C. exilicauda*.

FAMILY CHACTIDAE

Genus **Superstitionia** Stahnke

(Figures 5, 6)

Superstitionia is distinguished from all other genera in Baja California as follows: sternum of prosoma pentagonal in form (not triangular);

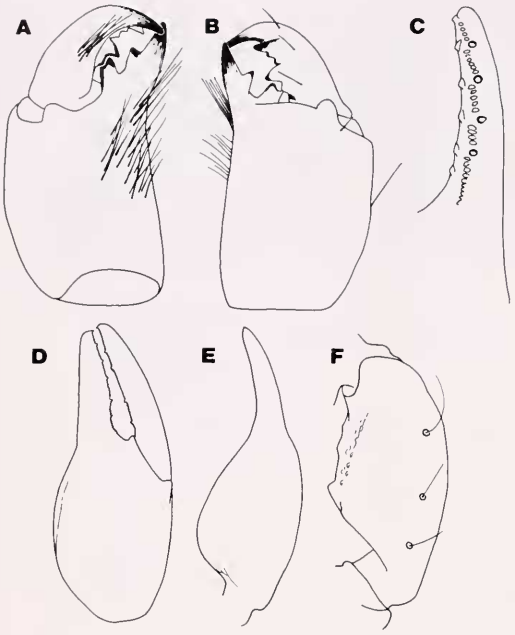

FIGURE 6. *Superstitionia donensis*, structural characters. (*A.*) Chelicera, ventral view. (*B.*) Chelicera, dorsal view. (*C.*) Pedipalp fixed finger showing primary-row denticles subdivided into oblique subrows. (*D.*) Pedipalp chela, prolateral view. (*E.*) Pedipalp chela, dorsal view. (*F.*) Pedipalp brachium, ventral view showing trichobothria.

pedipalp fingers with supernumerary granules flanking primary-row denticles only on prolateral side (no supernumerary granules on retrolateral side); pedipalp fingers with primary-row denticles subdivided into five or six, nonoverlapping, oblique subrows; telson lacking subacular tubercule; two pedal spurs at origin of last tarsal segment of hind walking legs; two lateral ocelli at each anterior lateral corner of carapace. This genus is monotypic with *Superstitionia donensis* the only species.

Superstitionia donensis Stahnke

(Figures 5–8)

Broteochactas alleni (Wood) [part]. BANKS 1910:185, 188.
Superstitionia donensis STAHNKE, 1940:102; 1949:243. GERTSCH AND ALLRED 1965:2, 7, 13, 14. JOHNSON AND ALLRED 1972:156. HJELLE 1972:5–7.
Diplops desertorum MULAIK AND HIGGINS, 1944:237–238.

DIAGNOSIS.—Adults to 25 mm long. Base color yellow to orange-brown, with overlying black pattern as follows: carapace with irregular dark markings over most of surface; mesosoma dorsally with three distinct black longitudinal stripes; metasoma ventrally with single longitudinal dark median line; cuticle conspicuously glossy. Metasoma without keels; segments I, II, and III each broader than long. Pedipalp with short fingers; finger of male with large gap when chela closed; opposing finger surface with primary-row denticles composed of 5–7 oblique, nonoverlapping subrows. Pectine teeth 6 on male and female; genital papillae in male.

TYPE DATA.—*Superstitionia donensis*, syntypes: H. L. Stahnke collection; Superstition Mountains, Arizona.

Diplops desertorum, two syntypes: ANSP, 26.7 km E Tucson, Arizona, 28–XII–1940, S. and D. Mulaik.

DISTRIBUTION.—Baja California Norte and Sur from Tecate south to La Paz, and on associated islands; Sonora; Arizona; New Mexico; Nevada; and California.

NEW RECORDS.—**Baja California Norte, Mexico:** 47 km E Tecate, 17–VII–1969 (Williams, Lee); 7.6 km N Rosarito, 27–XII–1973 (Johnson, Ruth); 6.4 km S La Rumorosa, 14–I–1965 (LBS); 14 km N Rancho El Topo, Sierra Juárez, 16–VII–1969 (Williams, Lee); 21 km N Laguna Hanson, Sierra Juárez, 16–VII–1969 (Williams, Lee); La Misión, 14–VII–1969 (Williams, Lee); 39.3 km S Ensenada, 1–XII–1962 (Craig, Dailey); Punta Banda, 13–VII–1962 (Parrish); 6.4 km W Santo Tomás, 11–VII–1969 (Williams, Lee); Puerto Santo Tomás, 10–XI–1957 (Cutler, LBS); Valle Trinidad, 14–III–1936 (SDMNH); 6.1 km S Santa María Sky Ranch, 25–XI–1962 (Craig, Dailey); Ensenada, 23–VI–1967 (Philipps Jr., SDMNH); San Vicente, 23–XI–1962 (Craig, Dailey); Arroyo Seco, 9–II–1964 (Allen, Croulet); 24 km E San Telmo de Arriba, 13–VII–1969 (Williams, Lee); 26 km E Meling Ranch, Sierra San Pedro Mártir, 13–VII–1969 (Williams, Lee); San Quintín, 24–XI–1962 (Craig, Dailey); Socorro, sand dunes, 12–VII–1969 (Williams, Lee); 11 km N Santa María, 12–VII–1969 (Williams, Lee); 17.2 km N El Rosario, 25–XI–1962 (Craig, Dailey); 3.2 km NW summit of Aguajito Grade, 7–IV–1969 (Williams); 9.5 km SE El Progreso, 18–XII–1962 (Parrish); 6.4 km S El Arenoso, 8–IV–1969 (Williams); 8.0 km W San Augustín, 26–III–1973 (Szerlip, CIS); 1.6 km S Tres Enriques, 8–IV–1969 (Williams); 0.8 km S La Virgen, 8–IV–1969 (Williams); 48.9 km S Rancho Santa Ynez, 28–XII–1973 (Johnson); 31.7 km N Laguna Chapala, 9–IV–1969 (Williams); Misión Calamajué, 3–X–1973 (Doyen, CIS); 13.0 km NW El Pedregoso, 17–XII–1962 (Parrish); 4.8 km N Punta Prieta, 25–II–1966 (Roth, AMNH); 10 km SW Misión San Borja, Rancho Ignacito, 17–I–1965 (Roth, AMNH); Misión San Borja, 16–I–1965 (Roth, AMNH); Miller's Landing, 17–I–1965 (Roth, AMNH); 55 km NNW Laguna Manuela, 22–VI–1968 (Williams, Cazier); Isla Salsipuedes, 23–III–1962 (Harbison, SDMNH); Isla San Pedro Mártir, 21–III–1962 (Harbison, SDMNH).

Baja California Sur: Mulegé, 26–I–1965 (Roth, AMNH); Bahía Concepción, El Coyote, 17–II–1966 (Roth, AMNH); San José de Comondú, 15–II–1966 (Roth, AMNH); 6.4 km SW San Miguel Comondú, 15–V–1969 (Williams); 6.4 km S El Arco, 17–IV–1969 (Williams); 60 km NW Bahía de los Ángeles, 10–IV–1969 (Williams); 77 km NW San Ignacio, 30–XI–1973 (Williams, Mullinex); La Paz, 1–3–II–1965 (Roth, AMNH).

FIGURE 7. *Superstitionia donensis*, male, dorsal and ventral views.

REMARKS.—This species is mainly found by turning over rocks, dead agave, and litter. It is most prominent in more arid habitats with sparse plant cover and appears to play an important role as predator in the dead agave and dead yucca recycling community.

FAMILY DIPLOCENTRIDAE

Genus **Didymocentrus** Kraepelin

(Figure 9)

Didymocentrus is distinguished from other genera in Baja California as follows: walking legs lacking distinct, rounded, lateral terminal lobes on last tarsomere; 2 or 3 lateral ocelli at each anterolateral corner of carapace; walking leg with one pedal spur; telson with large conspicuous subaculear tooth; pedipalp fingers short, palm swollen and flattened. Four species are found in Baja California.

KEY TO BAJA CALIFORNIA DIPLOCENTRIDAE: GENUS *DIDYMOCENTRUS*

1. Three pairs of lateral eyes (Fig. 9*A*); Cape region ..... *D. caboensis*
   Two pairs of lateral eyes (Fig. 9*B*) 2

2(1). Last tarsomere with basic spiniform se-

FIGURE 8. Distribution of *Superstitionia donensis*.

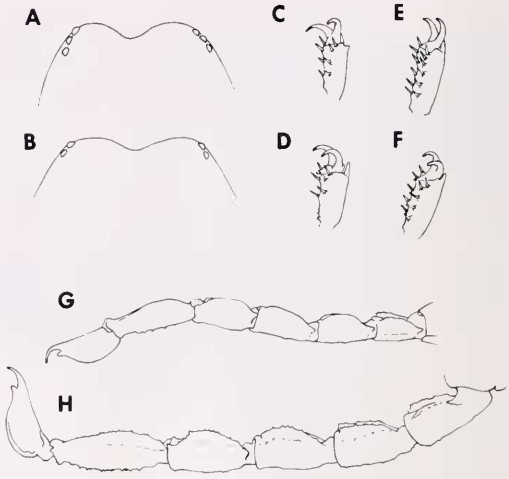

FIGURE 9. Structural characteristics of species of *Didymocentrus* from Baja California. (*A.*) *Didymocentrus caboensis* showing three pairs of lateral ocelli. (*B.*) *Didymocentrus comondae* showing two pairs of lateral ocelli. (*C.*) *Didymocentrus cerralvensis*, distal tarsomere of first walking leg showing characteristic spiniform setae. (*D.*) *Didymocentrus cruzensis*, distal tarsomere of first walking leg showing characteristic spiniform setae. (*E.*) *Didymocentrus cerralvensis*, distal tarsomere of fourth walking leg showing spiniform setae. (*F.*) *Didymocentrus comondae*, distal tarsomere of fourth walking leg showing spiniform setae. (*G.*) *Didymocentrus comondae*, lateral view of metasoma showing reduced keelation dorsally. (*H.*) *Didymocentrus cruzensis*, lateral view of metasoma showing granular keelation dorsally.

tae formula $\frac{4}{4}$, $\frac{5}{5}$, $\frac{6}{6}$, $\frac{6}{6}$ on walking legs one to four, respectively (Figs. 9*C*, *E*); Isla Cerralvo ..... *D. cerralvensis*

Last tarsomere with basic spiniform setae formula $\frac{3}{3}$, $\frac{4}{4}$, $\frac{5}{5}$, $\frac{5}{5}$ on walking legs one to four, respectively (Figs. 9*D*, *F*) 3

3(2). Keels of metasomal segments prominent, granulations strongly serrate (Fig. 9*H*); Isla Santa Cruz ..... *D. cruzensis*

Keels not prominent, usually with at most only a few small granules (Fig. 9*G*) ..... *D. comondae*

Didymocentrus caboensis Stahnke

(Figures 9*A*, 10, 13)

Didymocentrus caboensis STAHNKE, 1968:274–276. WILLIAMS AND LEE 1977:4–5.

DIAGNOSIS.—Adults to about 50 mm long. Base color chocolate-brown to yellow-brown. Three pairs lateral ocelli; spiniform setae on tarsomere II of walking legs 1–4, respectively, number: $\frac{3}{3}$, $\frac{4}{4}$, $\frac{5}{5}$, $\frac{5}{5}$; pectine teeth 11–13 in males, 9–11 in females. Metasomal keels obsolete to reduced; dorsal keels reduced to a few low granules; segment I with dorsolateral keels as row of granules, on other segments not as well developed; ventrolateral and ventromedian keels of segments I and II keeled as distinct lines, other segments with few granules or with obsolete keels; metasomal segment V with ventrolateral keels as indistinct line of coarse granules, ventromedian keel as incomplete line of few coarse granules.

Similar to *Didymocentrus comondae* (Stahnke), but distinguished by presence of three pairs of lateral ocelli.

TYPE DATA.—*Didymocentrus caboensis*, holotype (female): MCZ; San José del Cabo, Baja California Sur, Mexico, collected before 1950.

DISTRIBUTION.—Cape region from San Antonio region south to Cabo San Lucas.

Didymocentrus cerralvensis (Stahnke)

(Figures 9(*C*, *E*), 11, 13)

Bioculus cerralvensis STAHNKE, 1968:279, 285–288.
Bioculus aguajensis STAHNKE, 1968:280, 281–283.
Bioculus figghoblyni STAHNKE, 1968:280, 300–301.

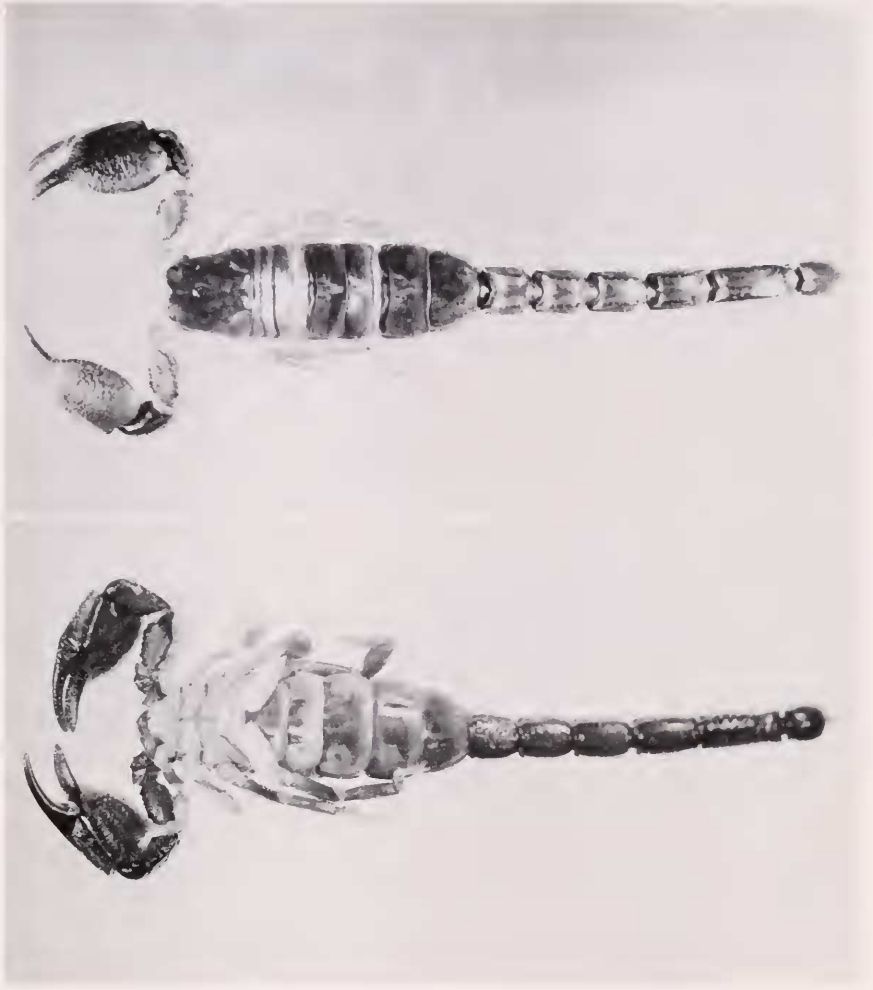

FIGURE 10. *Didymocentrus caboensis*, male, dorsal and ventral views.

Bioculus parrishi STAHNKE, 1968:280, 308–311.
Didymocentrus cerralvensis (Stahnke). WILLIAMS AND LEE 1975:6–7.

DIAGNOSIS.—Two pairs lateral ocelli: adults to 55 mm long; spiniform setae on tarsomere II of walking legs 1–4, respectively number: $\frac{4}{4}$, $\frac{5}{5}$, $\frac{6}{6}$, $\frac{6}{6}$; pectine teeth 11 in males, 8–10 in females; metasomal segments with keels generally as in *Didymocentrus comondae* (Stahnke), but ventrolaterals more reduced; hirsuteness of cauda as in *D. comondae*.

Like gigantic form of *D. comondae* from Las Cruces area, but distinguished by formula of spiniform setae on tarsomere II, larger body size, and more slender metasomal segments.

TYPE DATA.—*Bioculus cerralvensis*, holotype (male): CAS, Type No. 9551; Isla Ceralbo [Cerralvo], Baja California Sur, Mexico, 21–III–1953, J. P. Figg-Hoblyn.

Bioculus aguajensis, holotype (female): CAS, Type No. 9549; Arroyo Aguaje, Isla Cerralvo, Baja California Sur, Mexico, 15–IV–1962, G. E. Lindsay.

Bioculus figghoblyni, holotype (male): CAS, Type No. 9555; Isla Cerralvo, Baja California Sur, Mexico, 10–III–1953, J. P. Figg-Hoblyn.

Bioculus parrishi, holotype (male): CAS, Type No. 9559; Rancho Rufo, Isla Cerralvo, Baja California Sur, Mexico, 16–IV–1962, C. Parrish. Allotype: CAS; Arroyo Aguaje, Isla

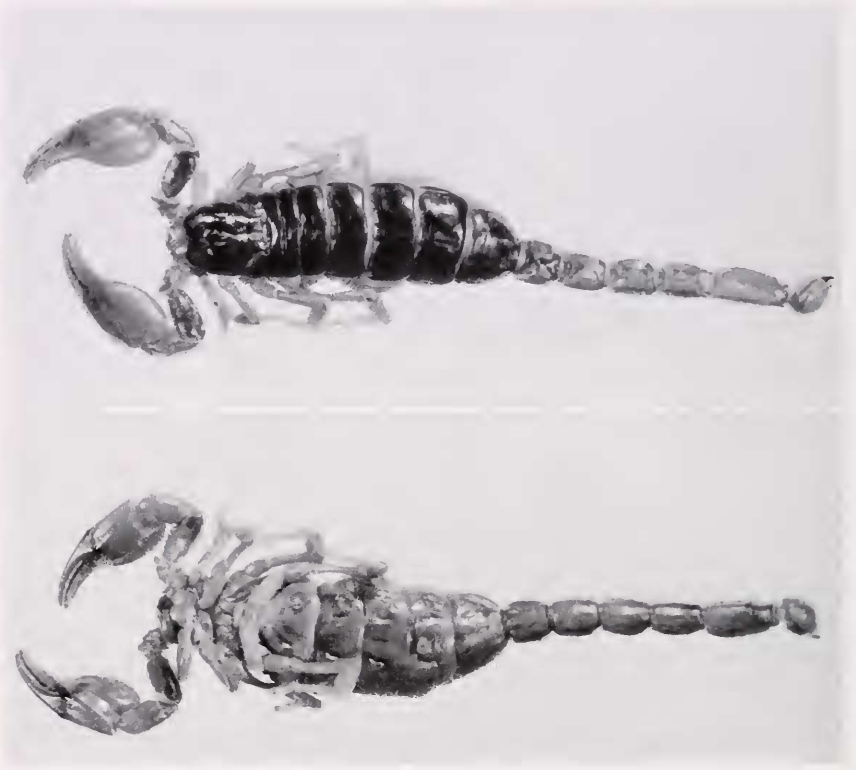

FIGURE 11. *Didymocentrus cerralvensis*, female, dorsal and ventral views.

Cerralvo, Baja California Sur, Mexico, 15–IV–1962, G. E. Lindsay.

DISTRIBUTION.—Isla Cerralvo.

Didymocentrus comondae (Stahnke)

(Figures 9(*B, F, G*), 12, 13)

Bioculus comondae STAHNKE, 1968:280, 288–289, 292–293.
Bioculus belvederi STAHNKE, 1968:280, 283–285.
Bioculus danzantiensis STAHNKE, 1968:280, 297–300.
Bioculus luteus STAHNKE, 1968:280, 304–306.
Bioculus parraensis STAHNKE, 1968:281, 306–308; 1971:238–239.
Bioculus santoensis STAHNKE, 1968:280, 313–315.
Bioculus similis STAHNKE, 1968: 281, 317–319.
Didymocentrus comondae (Stahnke). WILLIAMS AND LEE 1975:7–10.

DIAGNOSIS.—Two pairs lateral ocelli; adult not over 55 mm long; tarsomere II spiniform setae formula: $\frac{3}{3}\frac{3}{3}$, $\frac{4}{4}\frac{4}{4}$, $\frac{5}{5}\frac{5}{5}$, $\frac{5}{5}\frac{5}{5}$; pectine teeth 9–11 in males, 7–9 in females; keels on metasomal segments reduced to obsolete, some populations with granulations on position of dorsal keels, but keels never distinct. Color variable throughout range, tawny to chocolate-brown.

TYPE DATA.—*Bioculus comondae*, holotype (male), allotype: CAS, Type No. 9552; Comondú, Baja California Sur, Mexico, 22–VII–1938, E. S. Ross, A. E. Michelbacher.

Bioculus belvederi, holotype (female), allotype: CAS, Type No. 9550; Isla Danzante, Baja California Sur, Mexico, 7–IV–1962, Belvedere Expedition.

Bioculus danzantiensis, holotype (female): CAS, Type No. 9554; Isla Danzante, Baja California Sur, Mexico, 7–IV–1962, Belvedere Expedition.

Bioculus luteus, holotype (female): CAS, Type No. 9557; SE side of Isla San Francisco, Baja California Sur, Mexico, 17–IV–1962, C. Parrish.

Bioculus parraensis, holotype (female): CAS, Type No. 9558; top of grade above Parras Ranch, Parras Canyon, Baja California Sur, Mexico, 22–V–1961, G. E. Lindsay.

Bioculus santoensis, holotype (male): CAS, Type No. 9561; Isla Espíritu Santo, Baja California Sur, Mexico, 23–III–1953, J. P. Figg-Hoblyn.

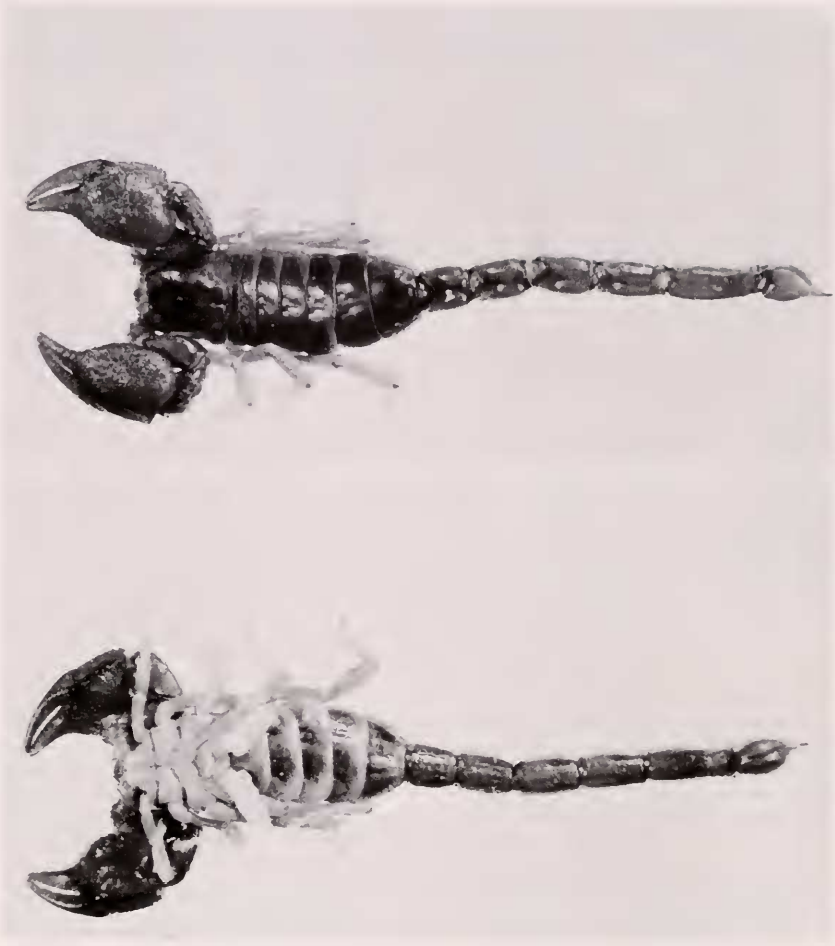

FIGURE 12. *Didymocentrus comondae*, male, dorsal and ventral views.

Bioculus similis, holotype (male): CAS, Type No. 9562; 16.6 km SW San José del Cabo, Baja California Sur, Mexico, 9–VII–1938, E. S. Ross, A. E. Michelbacher.

DISTRIBUTION.—San Ignacio south to San Antonio, and following islands: Danzante, San José, San Francisco, Partida, and Espíritu Santo.

Didymocentrus cruzensis (Stahnke)

(Figures 9*D*, 13)

Bioculus cruzensis STAHNKE, 1968:280, 293–297.
Bioculus lindsayi STAHNKE, 1968:281, 301–304.
Bioculus prolatio STAHNKE, 1968:280, 311–313.
Didymocentrus cruzensis (Stahnke). WILLIAMS AND LEE 1975:10.

DIAGNOSIS.—Chocolate-brown; two pairs lateral ocelli; adult over 55 mm long; tarsomere II spiniform setae formula: $\frac{3}{3}\frac{3}{3}$, $\frac{4}{4}\frac{4}{4}$, $\frac{5}{5}\frac{5}{5}$, $\frac{5}{5}\frac{5}{5}$ on walking legs one to four, respectively; pectine teeth 9–10 in males, 8–9 in females. Metasomal segments with more prominent granules along keels than in other related species, granules on dorsal keels few, coarse, forming line on segments I–IV, keel never incomplete, more or less equally developed among these segments; dorsolateral keels of segments I–IV less prominent but distinguishable; segment V with prominent dorsolateral keels, laterals appear as ridge, ventrolaterals and ventromedians with prominent well-spaced coarse granules. Adults distinguished from related species by prominent dorsal and dorsolateral keels.

TYPE DATA.—*Bioculus cruzensis*, holotype (male): CAS, Type No. 9553; Isla Santa Cruz,

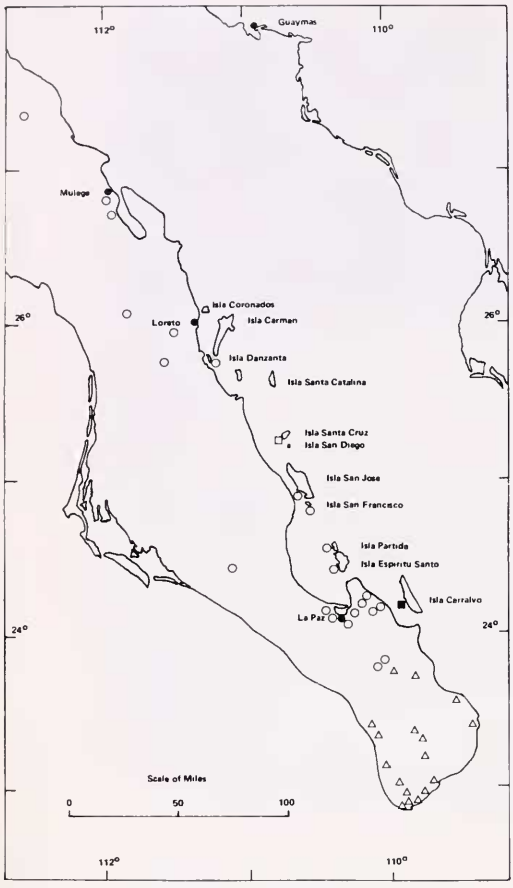

FIGURE 13. Distribution of *Didymocentrus caboensis* (triangles), *D. cerralvensis* (closed squares), *D. comondae* (circles), and *D. cruzensis* (open squares).

Baja California Sur, Mexico, 26–III–1953, J. P. Figg-Hoblyn.

Bioculus lindsayi, holotype (female): CAS, Type No. 9556; SW side Isla Santa Cruz, Baja California Sur, Mexico, 18–IV–1962, G. E. Lindsay.

Bioculus prolatio, holotype (female): CAS, Type No. 9560; Isla Santa Cruz, Baja California Sur, Mexico, 26–III–1953, J. P. Figg-Hoblyn.

DISTRIBUTION. Isla Santa Cruz.

FAMILY VAEJOVIDAE

Genus **Anuroctonus** Pocock

(Figures 14–16)

Anuroctonus is distinguished from other genera in Baja California as follows: four lateral ocelli on each side of carapace; ventromedian and ventrolateral keels of metasomal segments

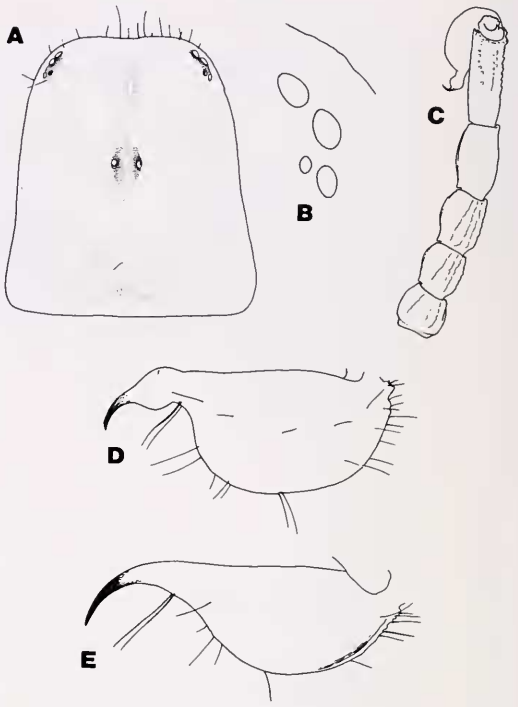

FIGURE 14. *Anuroctonus phaiodactylus*, structural characteristics. (*A.*) Carapace showing four pairs of lateral ocelli. (*B.*) Group of lateral ocelli. (*C.*) Ventral view of metasoma of male showing contrasting degeneration of ventral keels of segment IV. (*D.*) Telson of mature male showing bulbous swelling at base of aculeus. (*E.*) Telson of mature female.

I, II, III, and V well developed and crenular, but obsolete on segment IV. This genus is monotypic and is restricted to western North America.

Anuroctonus phaiodactylus (Wood)

(Figures 14–18)

Centrurus phaiodactylus WOOD, 1863a:111; 1863b:372.

Uroctonus phaeodactylus (Wood). KARSCH 1879:102. MARX 1887:91. KRAEPELIN 1894:196–198.

Anuroctonus phaeodactylus (Wood). POCOCK 1893:309; 1902:13–14. KRAEPELIN 1899:183. MOLES 1921:13. HOFFMANN 1931:404–405. WERNER 1935:284. GERTSCH 1958:14; 1965:11–12. DIAZ-NAJERA 1970:116. JOHNSON AND ALLRED 1972:157. STAHNKE 1974:118, 127–129.

Onocentrus phaeodactylus (Wood). THORELL 1894:375.

Uroctonus phaiodactylus (Wood). BANKS 1900:424; 1904:365.

Anuroctonus phaiodactylus (Wood). BANKS 1910:188. EWING 1928:14–15. WILLIAMS 1971a:78–79. HJELLE 1972:5, 7–8.

DIAGNOSIS.—Adults to about 65 mm long; base color of cuticle yellowish brown to brown; pedipalp fingers darker than palm. Four ocelli at each anterolateral corner of carapace; ventromedian keels of metasomal segments I, II, III,

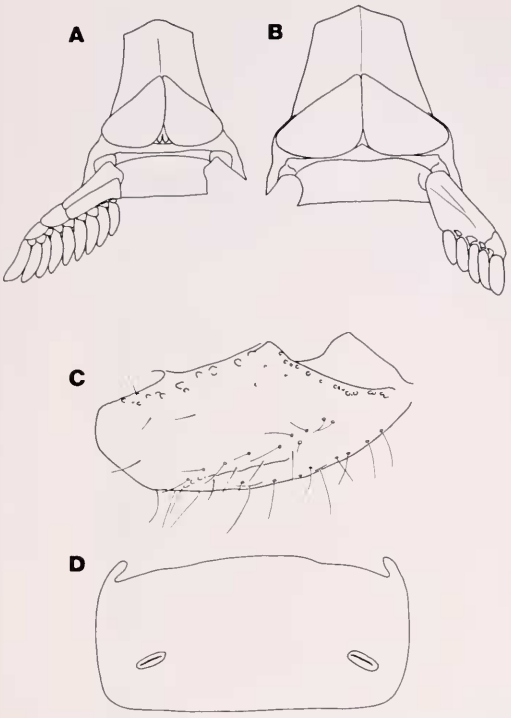

FIGURE 15. *Anuroctonus phaiodactylus*, structural characteristics. (*A.*) Pectines of male with genital operculum, genital papillae, and prosomal sternum. (*B.*) Pectines of female with genital operculum and prosomal sternum. (*C.*) Pedipalp brachium, ventral view showing trichobothria. (*D.*) Mesosomal sternum, ventral view showing stigma.

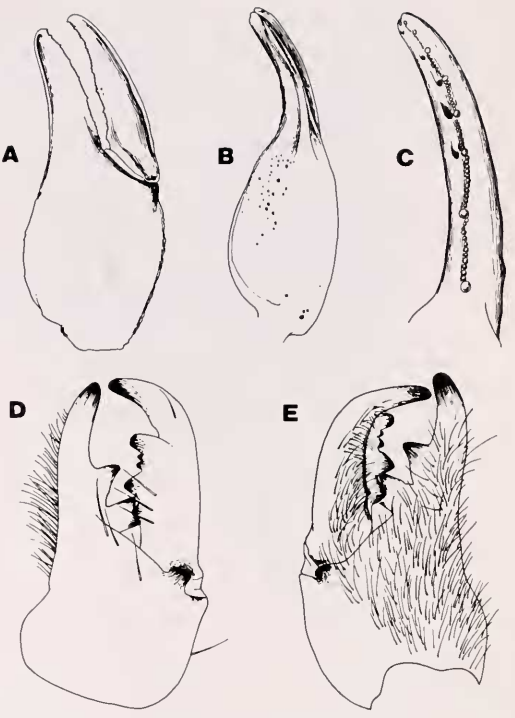

FIGURE 16. *Anuroctonus phaiodactylus*, structural characteristics. (*A.*) Pedipalp chela, retrolateral view. (*B.*) Pedipalp chela, dorsal view. (*C.*) Pedipalp fixed finger showing primary denticles. (*D.*) Chelicera, dorsal view. (*E.*) Chelicera ventral view (note: ventral margin of movable finger often with more denticles developed).

and V well developed and crenular, obsolete or greatly reduced on segment IV; metasomal segments III and IV each wider in middle than on articular ends. Vesicle of telson large; aculeus of mature male with bulbous swelling at base. Ventral margin of movable cheliceral finger with up to four denticles. Pectine teeth 5–8 in females, 7–10 in males; pedipalp brachium with about 10–12 trichobothria on ventral surface.

TYPE DATA.—*Centrurus phaiodactylus*, holotype (male): USNM, S-4 (Jar 2); "Utah." Information given in the original description: "Utah territory; M. McCarthy, Esq." Type-specimen differed from original description as follows: 8–9 pectinal teeth, not 7–10.

DISTRIBUTION.—Baja California: U.S. border south to southern foothills of Sierra San Pedro Mártir; California; Nevada; Utah.

NEW RECORDS.—**Baja California Norte, Mexico:** Colonia Independencia, Tijuana, 27–VII–1962 (Nogales); 53 km S Tecate, 17–VII–1969 (Williams, Lee); 3.2 km W La Rumorosa, 17–VII–1969 (Williams, Lee); La Misión, 1–IX–1968 (Knibbs, SDMNH); 8.0 km N Rancho El Topo, Sierra Juárez, 16–VII–1969 (Williams, Lee); 1.6 km E Guadalupe, 15–VII–1969 (Williams, Lee); 11 km N Laguna Hanson, Sierra Juárez, 16–VII–1969 (Williams, Lee); 6.4 km NNE El Sauzal, 15–VII–1969 (Williams, Lee); 18 km SE Ojos Negros, 15–VII–1969 (Williams, Lee); 72 km E Ensenada, Santa Isabel 30–VI–1962 (Estavillo, Clites); Rancho Filipinas and Rancho Viejo (midway), 30–VI–1962 (Estavillo, Clites); 6.4 km SW La Zapopita, Valle Trinidad, 16–IV–1961 (Truxal, LACM); 19 km SE Maneadero, 19–IV–1965 (Cavagnaro, Ross, Vesterby); Punta Banda, 10–VII–1969 (Williams, Lee); Puerto Santo Tomás, 11–VII–1969 (Williams, Lee); Santo Tomás Valley, 5–IV–1969 (Williams); 35 km S San Vicente, 6–IV–1969 (Williams); 3.2 km SE Eréndira, 12–V–1973 (Williams, Blair); 2.6 km N Punta Calaveras, Hematite Mine, 13–VII–1962 (Parrish); Mike's Sky Ranch, Sierra San Pedro Mártir, 14–15–VI–1973 (Williams, Blair); 11 km E Meling Ranch, Sierra San Pedro Mártir, 13–VII–1969 (Williams, Lee); El Progreso, Sierra Juárez, 1–IV–1969 (Williams).

Genus **Hadrurus** Thorell

(Figures 19–21)

Hadrurus is distinguished from other genera in Baja California as follows: prosomal sternum pentagonal; pedipalp fingers with supernumer-

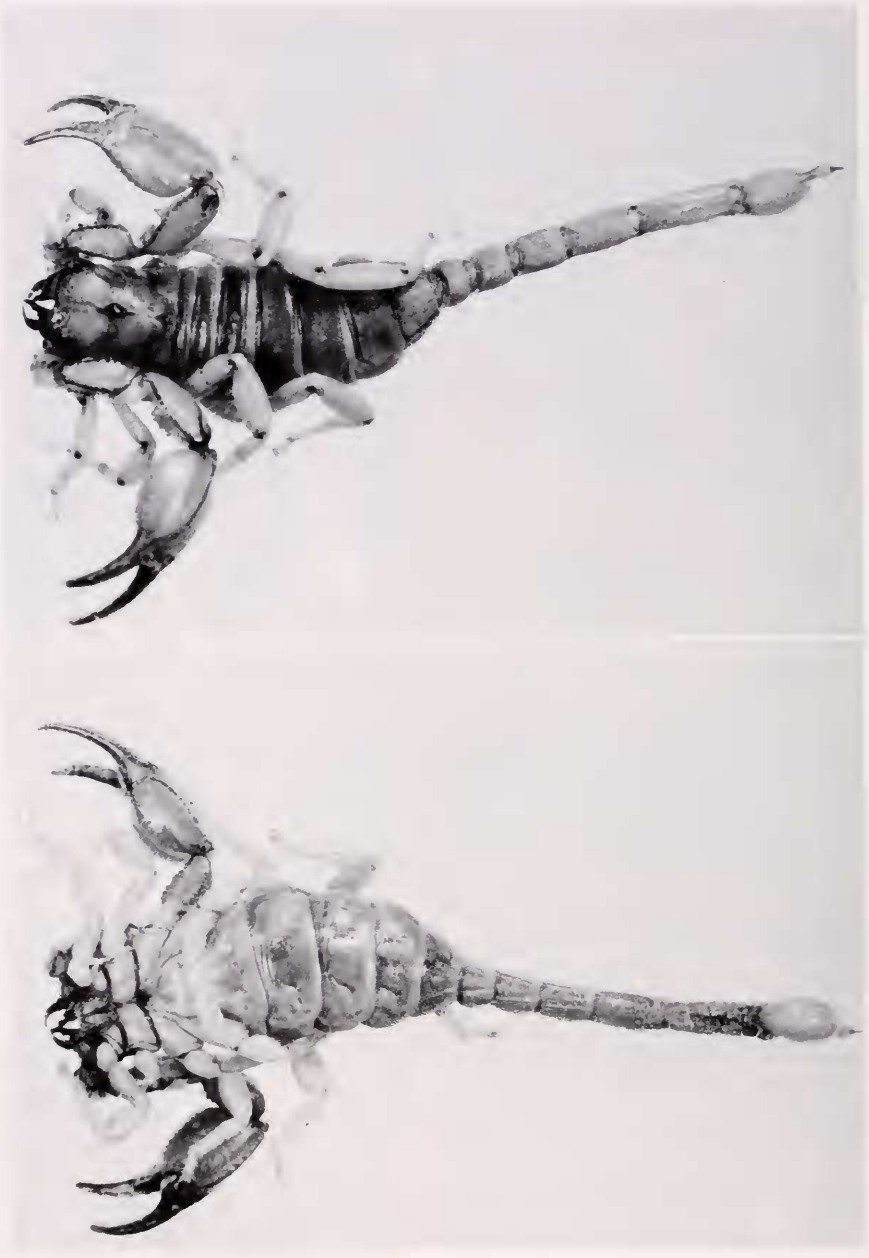

FIGURE 17. *Anuroctonus phaiodactylus*, male, dorsal and ventral view.

ary granules flanking primary row on prolateral side only; three lateral ocelli at each anterolateral corner of carapace; ventral margin of movable cheliceral finger with one long, dark, conspicuous tooth; males lacking genital papillae; metasoma with ventromedian and ventrolateral keels on segments II–IV always present and paired. Scorpions belonging to *Hadrurus* are called "Giant Hairy Scorpions" and are among the largest North American species. Five species of *Hadrurus* are found in Baja California.

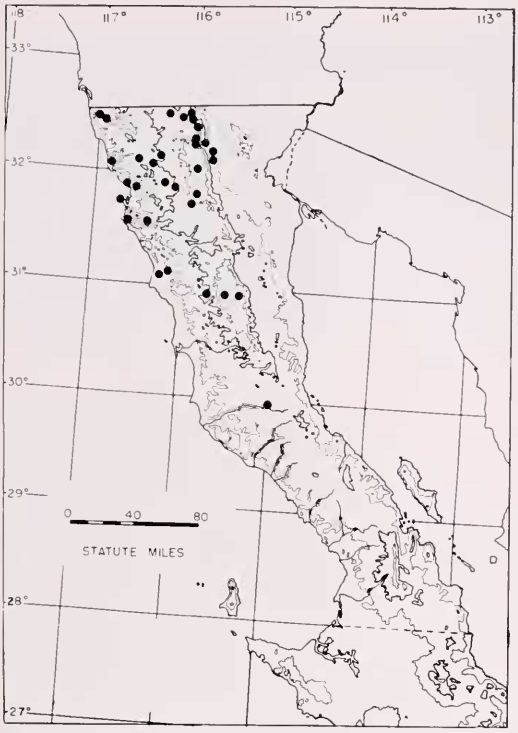

FIGURE 18. Distribution of *Anuroctonus phaiodactylus*.

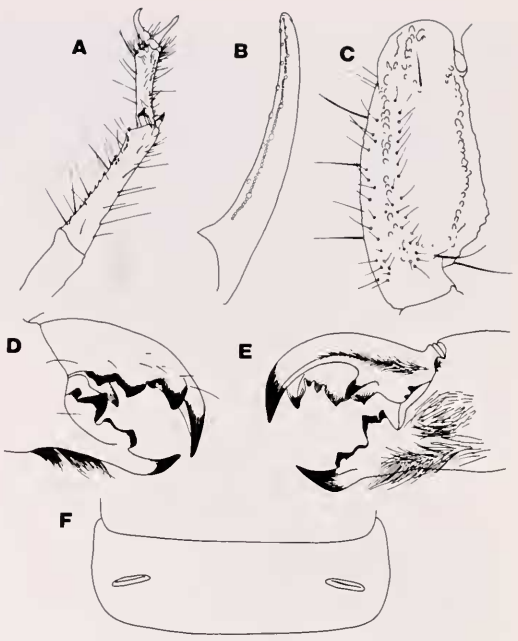

FIGURE 19. Structural characteristics of *Hadrurus* (figured from *Hadrurus hirsutus*). (*A.*) Termination of walking leg showing serrate pedal spurs and setation. (*B.*) Pedipalp movable finger showing primary-row denticles and supernumerary denticles. (*C.*) Pedipalp brachium, ventral view, showing location of trichobothria along retrolateral margin. (*D.*) Chelicera, dorsal view. (*E.*) Chelicera, ventral view showing characteristic enlarged denticle on ventral margin of movable finger. (*F.*) Mesosomal sternum showing stigma.

KEY TO THE BAJA CALIFORNIA *HADRURUS*

1. Interocular region of carapace completely blackish (Fig. 27) ..... *H. pinteri*
   Interocular region of carapace not completely blackish, but yellow anteriorly (Fig. 20*A–C*) 2

2(1). Pedipalp fingers light yellow, similar to palm in color ..... (*H. arizonensis*) 3
   Pedipalp fingers reddish or brownish, darker than palm in color 5

3(2). Mesosomal dorsum dark olive (similar to Fig. 20*B*) ..... *H. arizonensis arizonensis*
   Mesosomal dorsum light yellow (Fig. 20*C, D*) 4

4(3). Dorsal keels of metasomal segment III of males distinctly hirsute to unaided eye (females somewhat variable) (Fig. 21*C*); females with metasoma I distinctly longer than wide ..... *H. arizonensis pallidus*
   Dorsal keels of metasoma III of male or female not hirsute to unaided eye (Fig. 21*D*); females with metasoma I about as long as wide or slightly wider than long ..... *H. arizonensis austrinus*

5(2). Space between ventromedian keels of metasomal segments I, II, or III set with about 8 or more stout reddish hairs (Fig. 20*G*); dorsum of mesosoma dark olive (Fig. 26) and with metasomal segment V not melanic (similar to Fig. 21*D*) ..... *H. obscurus*
   Space between ventromedian keels of metasomal segments I, II, or III not hirsute (this space completely lacks hairs or has less than 6 hairs per segment); mesosomal dorsum reddish or yellowish with metasomal segment V nonmelanic, or if mesosoma dorsum melanic, metasoma V also melanic (Fig. 21*E*) 6

6(5). Adult males with one pair of swollen glandular patches visible to unaided eye on dorsal surface of vesicle at base of

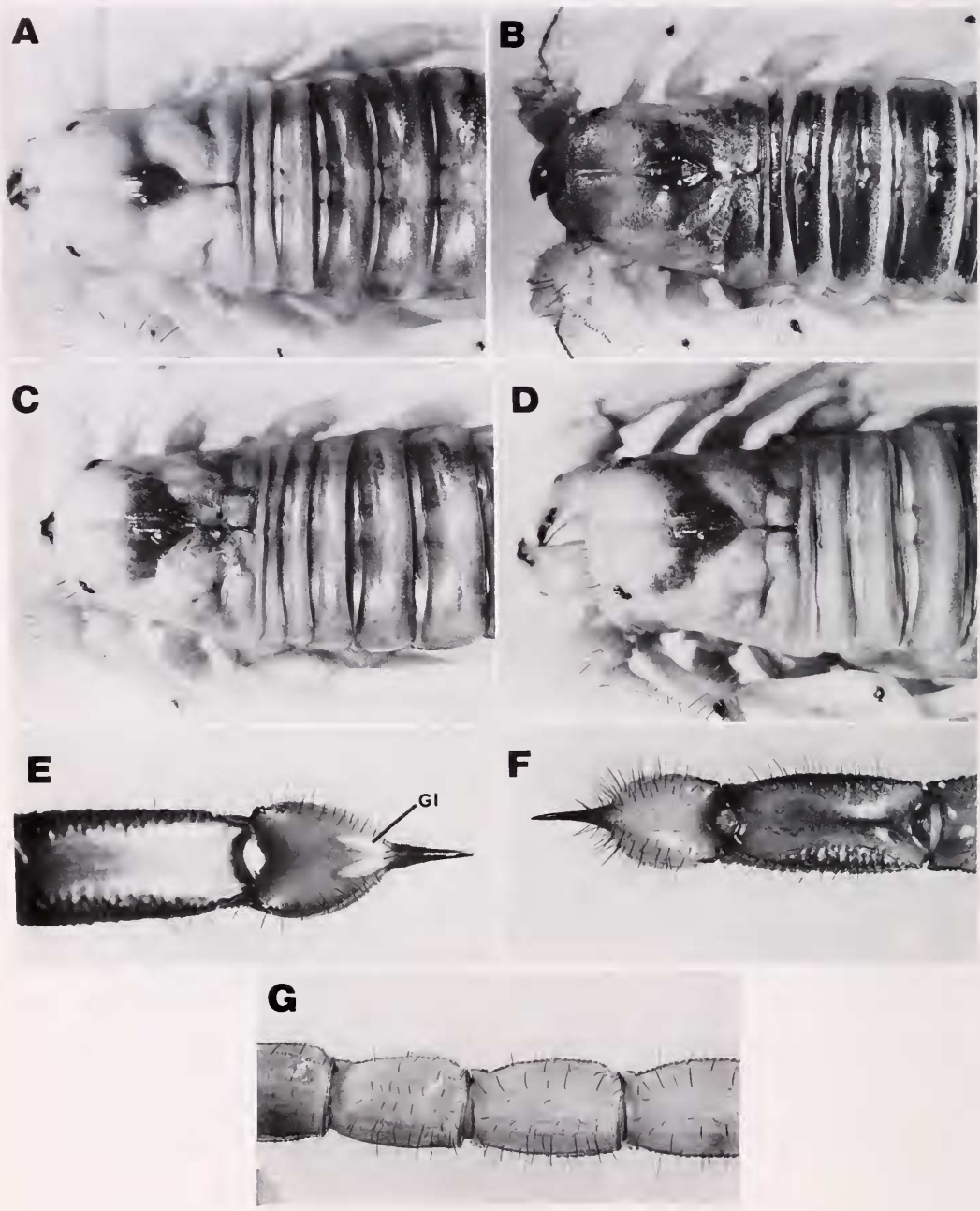

FIGURE 20. Diagnostic characteristics of species of *Hadrurus*. (*A.*) *Hadrurus concolorous*, male. (*B.*) *Hadrurus hirsutus*, male. (*C.*) *Hadrurus arizonensis pallidus*, holotype, male. (*D.*) *Hadrurus arizonensis austrinus*, holotype, male. (*E.*) *Hadrurus pinteri*, dorsal view of male telson showing external glands (*Gl*). (*F.*) *Hadrurus hirsutus*, dorsal view of male telson. (*G.*) *Hadrurus obscurus*, ventral view of metasoma showing setation between ventromedian keels.

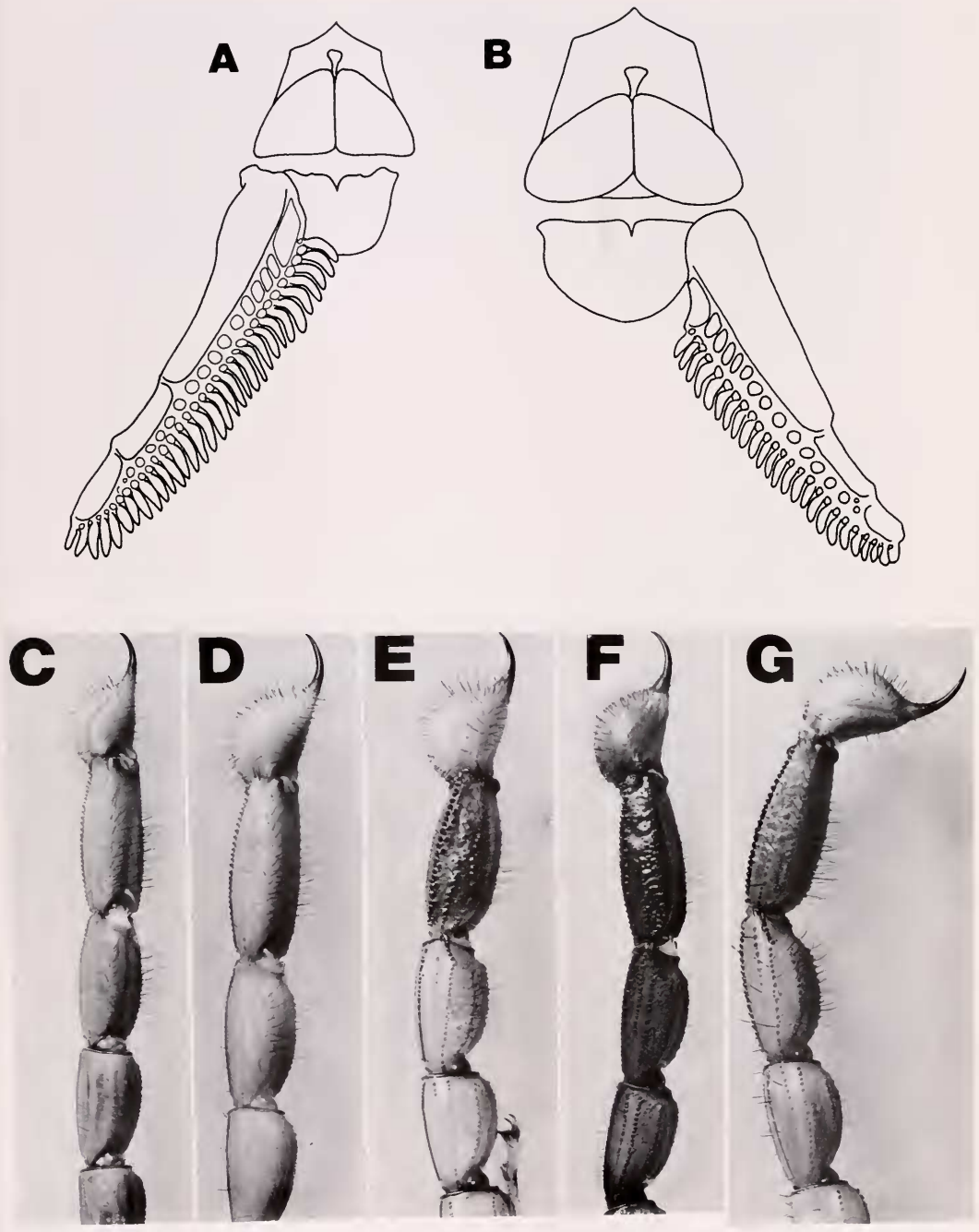

FIGURE 21. Structural characteristics of species of *Hadrurus*. (*A.*) *Hadrurus hirsutus*, male pectine, genital operculum (note absence of genital papillae) and prosomal sternum. (*B.*) *Hadrurus hirsutus*, female pectines, genital operculum and prosomal sternum. (*C.*) *Hadrurus arizonensis pallidus*, male. (*D.*) *Hadrurus arizonensis austrinus*, male. (*E.*) *Hadrurus hirsutus*, male. (*F.*) *Hadrurus pinteri*, male. (*G.*) *Hadrurus concolorous*, male.

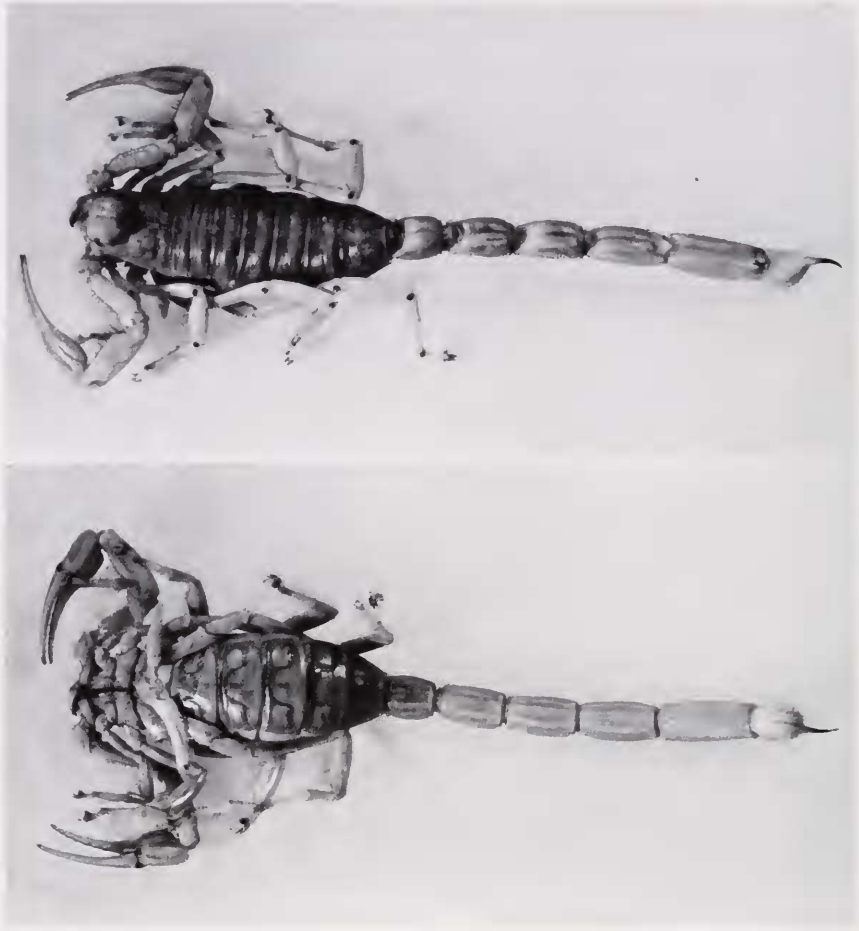

FIGURE 22. *Hadrurus arizonensis pallidus*, male, dorsal and ventral views.

aculeus (similar to Fig. 20*E*); females with dorsal keels of metasoma V not conspicuously hirsute to unaided eye; males with metasoma I longer than wide; usually yellow or rusty on dorsum but sometimes melanic ..... *H. concolorous*

Adult males without pair of swollen, oval, glandular patches visible on dorsal surface of vesicle at base of aculeus (Fig. 20*F*); females with dorsal keels of metasoma V conspicuously hirsute to unaided eye (Figs. 20*F*, 21*E*); males with metasoma I wider than long; dorsum dark olive with melanic metasoma V ..... *H. hirsutus*

Hadrurus arizonensis Ewing

DIAGNOSIS.—Base color of cuticle pale to deep yellow; interocular area on carapace yellow, never melanic; pedipalp palms and fingers yellow; posterior of carapace and dorsum of mesosoma dark olive to pale yellow. Telson hirsute on all aspects, no externally visible oval glands on dorsal surface of vesicle near origin of aculeus in mature males. Pedipalp with 10–15 long, conspicuous hairs on inner surface of palm. Metasoma with space between ventromedian keels lacking hairs or with fewer than 5 stout hairs per segment; segments IV and V with dorsal keels distinctly hirsute to unaided eye, females distinctly less hirsute than males.

Similar to *Hadrurus obscurus* but distinguished as follows: fingers yellow (not reddish brown); space between ventromedian keels of metasomal segments I to III not densely covered with stout bristles.

REMARKS.—Polytypic species composed of three subspecies based on color, pattern, and hirsuteness of metasomal dorsal keels. Two subspecies in Baja California are recognized: *H. a. austrinus* and *H. a. pallidus*.

Hadrurus arizonensis pallidus Williams

(Figures 20*C*, 21*C*, 22, 23)

Hadrurus hirsutus (Wood). KRAEPELIN 1899:188 [part?]. BANKS 1900:424. POCOCK 1902:6–7. BANKS 1910:188. EWING 1928:8. HOFFMANN 1931:335–340. STAHNKE 1940:101 [part]; 1945:5–6. DIAZ-NAJERA 1964:27. WILLIAMS AND HADLEY 1967:107–108. STAHNKE 1969:60–61; 1974:126.

Hadrurus arizonensis pallidus WILLIAMS, 1970e:22–25.

DIAGNOSIS.—Entire body bright yellow, nonmelanic except for thin dusky crescent through interocular area; some individuals with interocular crescent faint to obsolescent, this common in older individuals. Pectine teeth 32–37 in males, 24–31 in females. Metasoma with dorsal keels of segment III densely hirsute to unaided eye in males, usually so, but variable, in females.

TYPE DATA.—*Hadrurus arizonensis pallidus*, holotype (male), allotype: CAS, Type No. 10447; 42 km E San Luis, Sonora, Mexico, 4–VI–1968, M. A. Cazier.

DISTRIBUTION.—Colorado Desert regions of northeastern Baja California and associated islands; Colorado Desert regions of southern California, Arizona, and Sonora.

REMARKS.—*Hadrurus arizonensis* (*arizonensis* × *pallidus*) intermediates occur along the eastern border of Baja California and on some associated islands. Such intermediate populations are composed of individuals with a wide range of color, but generally tend to be less melanic than *Hadrurus arizonensis arizonensis* (see Williams 1970e).

Hadrurus arizonensis austrinus Williams

(Figures 20*D*, 21*D*, 23)

Hadrurus arizonensis austrinus WILLIAMS, 1970e:26–28.

DIAGNOSIS.—Entire body pale yellow except for thin dusky interocular cresent; dorsal keels of metasomal segment III not distinctly hirsute to unaided eye; pectine teeth 35–41 in males, 28–32 in females.

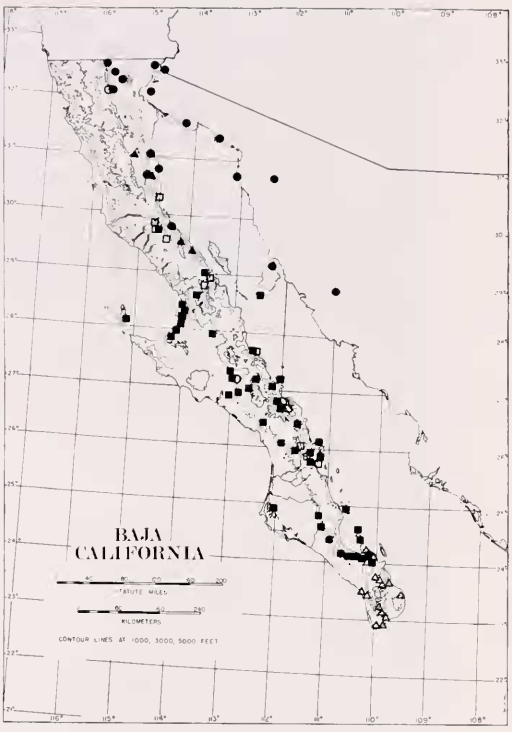

FIGURE 23. Distribution of *Hadrurus arizonensis austrinus* (closed triangles), *Hadrurus arizonensis pallidus* (closed circles), *Hadrurus concolorous* (closed squares), *Hadrurus hirsutus* (open triangles), *Hadrurus obscurus* (open circles), and *Hadrurus pinteri* (open squares).

TYPE DATA.—*Hadrurus arizonensis austrinus*, holotype (male), allotype: CAS, Type No. 10446; 13 km N Bahía San Luis Gonzaga, Baja California Norte, Mexico, 13–VI–1968, S. C. Williams, M. A. Cazier.

DISTRIBUTION.—Gulf coast from Oakie Landing south to Bahía San Luis Gonzaga.

Hadrurus concolorous Stahnke

(Figures 20*A*, 21*G*, 23, 24)

Hadrurus hirsutus (Wood). KRAEPELIN 1894:205–206 [part?]; 1899:188 [part]. STAHNKE 1969:60–61 [part].

Hadrurus concolorous STAHNKE, 1969:59–60. WILLIAMS 1970e:13–17.

DIAGNOSIS.—Adults to 119 mm long. Entire body reddish yellow to dusky; with or without dusky metasomal segment V; pedipalp palm yellow with light reddish-brown fingers. Adult males with conspicuous pair of glands on dorsum of telson at base of aculeus. Pectine teeth 34–40 in males, 27–33 in females. Dorsal keels of female metasoma not conspicuously hirsute

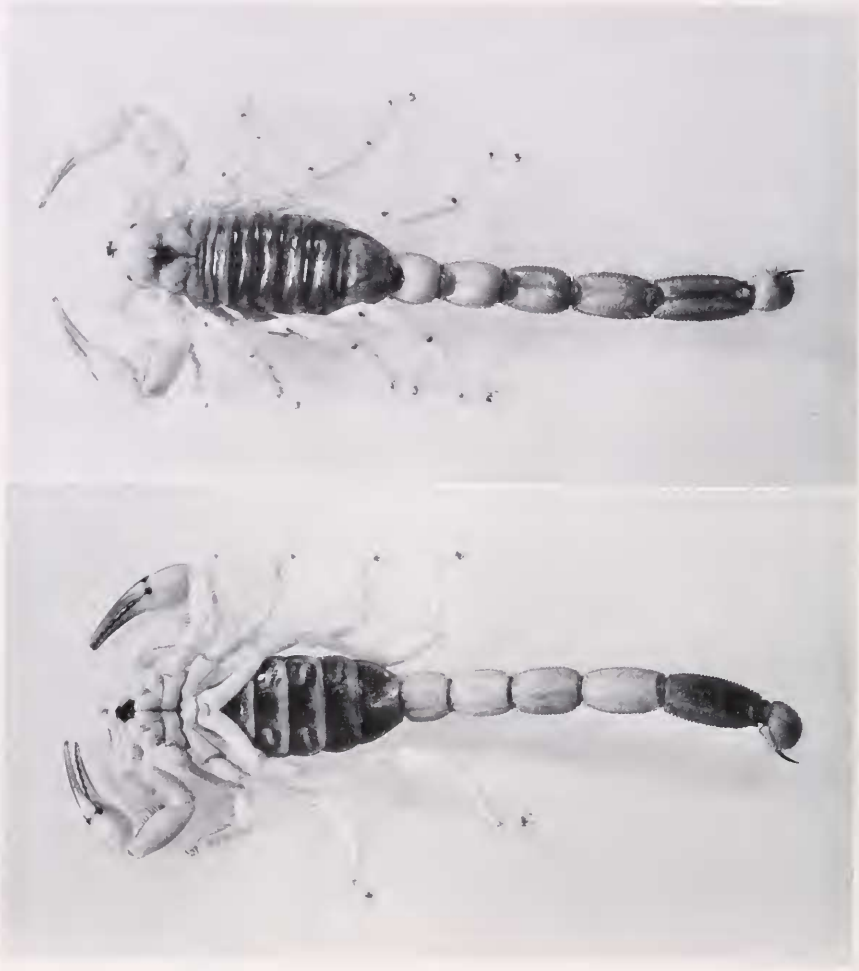

FIGURE 24. *Hadrurus concolorous*, male, dorsal and ventral views.

on segment III; segments IV and V with numerous short inconspicuous bristles; those of male not conspicuously hirsute on segment III, densely hirsute with long conspicuous hairs on segments IV and V. Space between ventromedian keels of metasomal segments I–III with 0–5 stout hairs; inner surface of pedipalp palm with less than 8 long conspicuous hairs.

Similar to *Hadrurus pinteri* Stahnke, but differs as follows: metasoma and telson light yellow; pedipalp palms yellowish with light reddish-brown fingers; telson venter of female with fewer and shorter hairs; dorsal keels of female metasomal segments IV and V with short inconspicuous bristles (not long conspicuous hairs); ventromedian intercarinal spaces of metasomal segments I–III not conspicuously hirsute, at times with up to 5 stout bristles, but these irregular and often completely lacking.

TYPE DATA.—*Hadrurus concolorous*, holotype (female): ASU, No. 68-602; 87.2 km N La Paz, Baja California Sur, Mexico, 14–VI–1968, L. L. and H. L. Stahnke. Allotype: CAS, Type No. 10445; Isla San Marcos, Baja California, Mexico, 21–III–1953, J. P. Figg-Hoblyn.

DISTRIBUTION.—Widely distributed throughout Baja California and associated islands.

REMARKS.—Found most abundantly in the Vizcaíno Desert and Magdalena Plain. Penetrates volcanic regions of the peninsula along river drainages where it occupies old stabilized flood plains and the lower slopes of valleys with

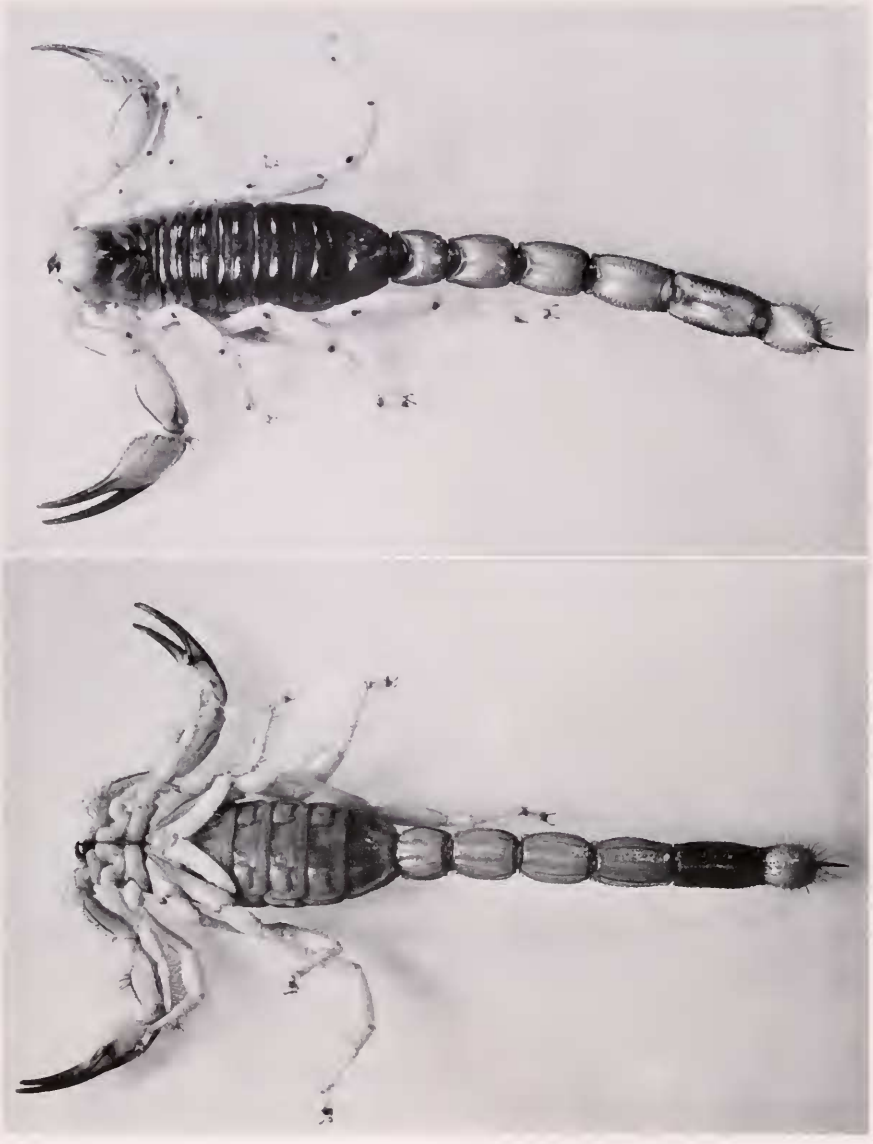

FIGURE 25. *Hadrurus hirsutus*, male, dorsal and ventral views (note characteristic darkening of metasomal segment V).

deposits of sandy sediment. In volcanic valleys *H. concolorous* may coexist with *H. pinteri*. Light phases, dark phases, and all degrees of intermediates exist. These do not appear to form subspecies, but local color races: dark races in volcanic areas; rusty-red races in areas where marine sedimentary or wind-deposited soils predominate. Some populations are homogeneous in coloration, others are highly variable, and still others (for example, at San Miguel Comondú) form a color dimorphism with dark and light rusty phases, but with no intermediates.

Hadrurus hirsutus (Wood)

(Figures 20(*B*, *F*), 21(*A*, *B*, *E*), 23, 25)

Buthus hirsutus WOOD, 1863a:108; 1863b:367.
Buthus emarginaticeps WOOD, 1863a:109; 1863b:367.
Hadrurus hirsutus (Wood). THORELL 1876a:11; 1876b:189; 1893:373. WILLIAMS 1970e:6–9.

Hadrurus emarginaticeps (Wood). Marx 1887:91. Kraepelin 1899:188
Hadrurus thayeri Stahnke, 1969:62–65; 1974:127.

Diagnosis.—Carapace and mesosoma with dark olive central color, this laterally bordered by yellow; region anterior to ocular tubercule yellow, dark pigmentation does not extend to lateral ocelli; metasomal segment V with contrasting dark pigment, this most noticeable ventrally; pedipalp palm light yellow with light reddish fingers; body otherwise light yellow; pectine teeth 28–35 in males, 22–27 in females. Metasoma of most individuals with space between ventromedian keels, without setae, no segment with more than 5 such setae; telson of adult male lacks externally visible dorsal glands at base of aculeus; internal surface of pedipalp palm with about 2–6 long setae; metasomal segment III not hirsute.

Similar to dark phase *Hadrurus concolorous*, but differs as follows: reduced pectine tooth count in both sexes; female telson more hirsute; hairs on female metasomal segment V relatively longer (30–35 percent of segment depth); dorsal surface of male telson slightly more hirsute; adult male lacks visible dorsal telson glands at base of aculeus.

Type Data.—*Buthus hirsutus*, lectotype (female): USNM, S-6 (Jar 2); "Lower California, J. Xantus de Vesey."

Buthus emarginaticeps: USNM (lost); "Lower California, J. Xantus de Vesey."

Hadrurus thayeri, holotype (female): ASU, No. 68-814; 8.5 km NE Cabo San Lucas, Baja California Sur, Mexico, 12–VI–1968, Z. L. and D. Thayer. Allotype: ASU, No. 65-0912; Las Cruces, Baja California Sur, Mexico, 29–IV–1965, A. Perez y Espinosa.

Distribution.—La Paz south to Cabo San Lucas.

Remarks.—In the U.S. National Museum there are two specimens in the type collection for this species. One specimen is labeled "Type number S-6, jar 2" bearing the data "Lower California, J. Xantus de Vesey" and is a female. The other specimen is labeled "Camp Yuma, Dr. Abbott," bears a label "Type," and is also a female. The specimen numbered type S-6 is herewith designated as lectotype. This specimen agrees with Wood's original description in locality data, collector, and Wood's description "dorsum very dark reddish brown . . . penultimate caudal segment is of the same reddish-brown as the body . . . ." This specimen does not differ significantly from *Hadrurus* recently collected in the Cabo San Lucas region, where de Vesey was located and did much of his collecting. The other specimen of *Hadrurus* labeled "type" appears to be *Hadrurus arizonensis*. This specimen does not agree with the locality or collector data published in the original description, nor does this specimen have the color pattern characteristics described by Wood in his publication.

This species was abundant in coarse gravelly habitats in the Cape region. In the southern part of its range, populations are homogeneous in color pattern and morphology, but in northern parts of the range (Las Cruces to La Paz), populations are variable in color and morphology. At Las Cruces, a distinctive color dimorphism occurs where a dark phase and a nonmelanic phase occur together.

Hadrurus obscurus Williams

(Figures 20*G*, 23, 26)

Hadrurus obscurus Williams, 1970:28–30.

Diagnosis.—Body pale yellow except for dark pigmentation on carapace and mesosoma; anterior region of carapace light yellow, yellow extends to ocular tubercule only along median groove; pedipalp finger reddish brown. Ventrolateral keels smooth to lightly crenulate on metasomal segments I–III, serrate on IV and V; ventromedian keels smooth to crenulate on I and II, irregularly crenulate on III, crenulate to serrate on IV; space between ventromedian keels of segments I–III with many conspicuous stout hairs. Pectine teeth 34–37 in males, 24–30 in females.

Similar to *Hadrurus spadix*, but differs as follows: anterior region of carapace not melanic; tendency for formation of thin, longitudinal, nonmelanic stripe down dorsomedian line of mesosoma; females with carapace longer than metasomal segment V (these approximate in *H. spadix*); females with metasomal segment I longer than wide (these approximate in *H. spadix*).

Also similar to *Hadrurus arizonensis* but differs as follows: hirsuteness of the space between the ventromedian keels of the metasoma and by reddish-brown pedipalp fingers.

Type Data.—*Hadrurus obscurus*, holotype (male): CAS, Type No. 10448; east of Panoche, 5.6 km W Fresno County line, along road be-

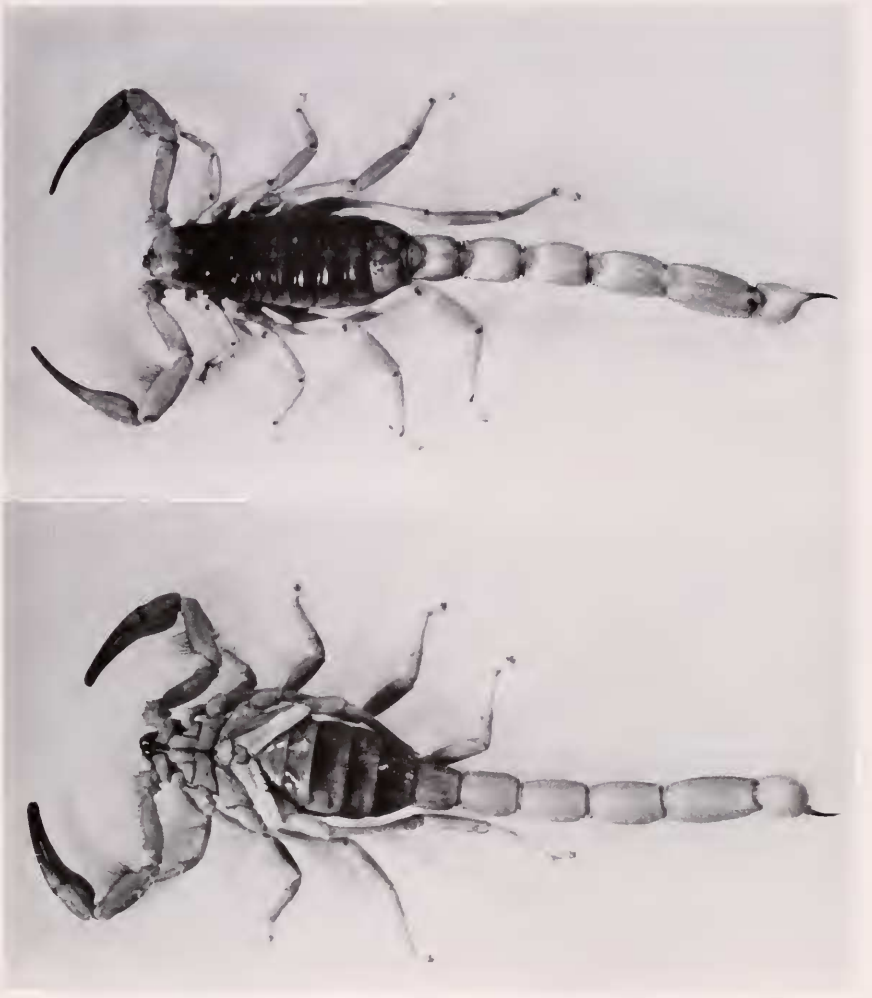

FIGURE 26. *Hadrurus obscurus*, male, dorsal and ventral views.

tween Panoche and Mendota, San Benito County, California, 14–VIII–1969, S. C. Williams, V. F. Lee, M. M. Bentzien. Allotype: CAS; same locality, 18–V–1968, S. C. Williams, J. R. Gabel, K. C. Schroen.

DISTRIBUTION.—Baja California Norte, desert canyons of eastern slopes of the Sierra Juárez; California, eastern slopes of Sierra Nevada south to Borego Valley.

REMARKS.—The *Hadrurus obscurus* in Baja California differ from typical specimens in the melanic color pattern of the carapace. Instead of the very broad V-shaped yellow markings through the interocular triangle, the Baja California forms have this marking much narrower in shape, a trait also shared by populations from desert San Diego County. The Baja California and San Diego County, California, forms are considered here as a geographic race of *H. obscurus* based on a slightly different color pattern of the carapace.

Hadrurus pinteri Stahnke

(Figures 20*E*, 21*F*, 23, 27)

Hadrurus pinteri STAHNKE, 1969:61–62. WILLIAMS 1970a:169–174; 1970e:17–18. STAHNKE 1974:126.

DIAGNOSIS.—Mesosoma and carapace brownish black; juveniles and subadults with conspicuous bright-yellow telson, sometimes

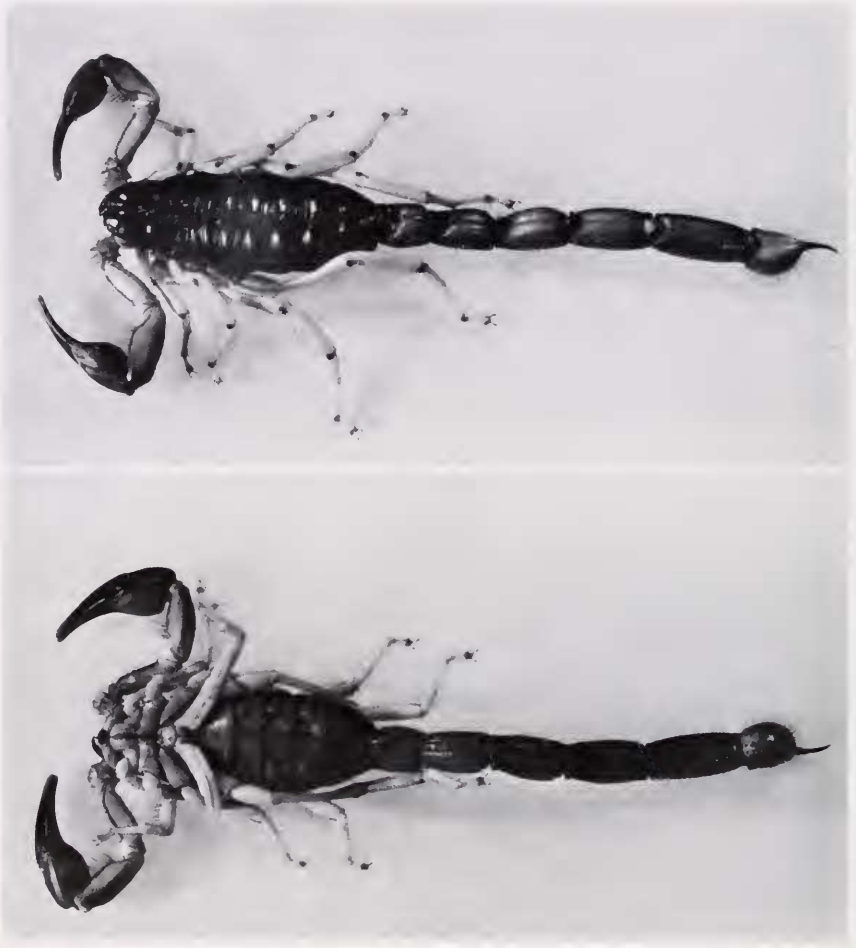

FIGURE 27. *Hadrurus pinteri*, male, dorsal and ventral views.

with yellow mottling of dark metasoma; pedipalp palm brownish yellow with dark reddish-brown to black fingers. Adults to 120 mm long. Vesicle densely hirsute except on dorsal surface; pectine teeth 28–35 in females, 38–44 in males. Metasoma with about 15 or more stout bristles in space between ventromedian keels of segments I–III. Adult males with 1 pair conspicuous oval glands on dorsum of telson at base of aculeus.

Similar to *Hadrurus concolorous*, but differs as follows: metasoma melanic; pedipalp palms brownish with dark reddish-brown fingers; telson venter of female more hirsute and hairs longer; dorsal keels of female metasomal segments IV and V set with long conspicuous hairs (not short and bristlelike); dorsum of telson with less than half the number of hairs (approximately 6); ventromedian intercarinal spaces of metasomal segments I–III conspicuously hirsute.

TYPE DATA.—*Hadrurus pinteri*, holotype (female): ASU, No. 68-0090; Puertecitos, Baja California Norte, Mexico, 24–II–1968, P. J. Pinter. Allotype: CAS, Type No. 12248; "Mission de Calamyget," Baja California, Mexico, 16–IV–1962, E. L. Sleeper.

DISTRIBUTION.—Puertecitos south to Puerto Escondido, and associated islands of Baja California.

REMARKS.—The specimen designated as allotype was originally deposited at California State University at Long Beach, but Professor W. D. Stockton subsequently deposited same at the California Academy of Sciences.

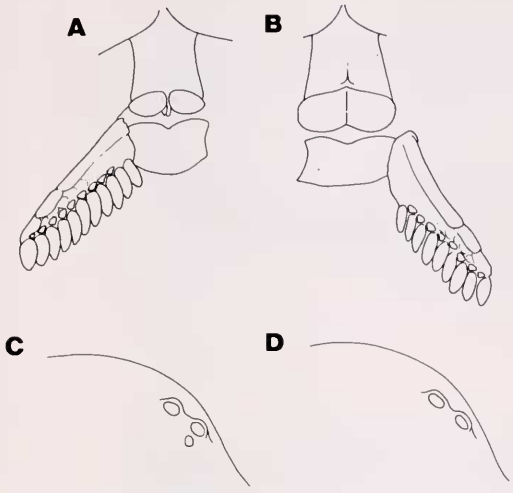

FIGURE 28. *Nullibrotheas allenii*, structural characteristics. (*A.*) Pectines of male with genital operculum, genital papillae, and prosomal sternum. (*B.*) Pectines of female with genital operculum and prosomal sternum. (*C.*) Anterolateral corner of carapace showing typical three ocelli. (*D.*) Anterolateral corner of carapace showing infrequent two-ocelli condition.

Genus **Nullibrotheas** Williams

(Figures 28, 29)

Nullibrotheas is distinguished from other genera of scorpions in Baja California as follows: brachium of pedipalp with posterior border of ventral surface with six trichobothria; pedipalp fingers with supernumerary granules flanking single primary row of denticles medially; males with large distinct genital papillae on inner margins of genital operculum; sternum pentagonal; stigma of book lungs minute, circular in shape. *Nullibrotheas* is monotypic and endemic to Baja California Sur and associated islands.

Nullibrotheas allenii (Wood)

(Figures 28–31)

Scorpius allenii WOOD, 1863a:360; 1863b:107.
Uroctonus privus KARSCH, 1879:103. HJELLE 1972:28–29.
Broteas allenii (Wood). MARX 1887:91.
Broteas formosus MARX, 1889:211 [nomen nudum].
Uroctonus mordax [part] KRAEPELIN, 1899:182.
Broteochactas alleni (Wood) [part]. BANKS 1910:188.
Broteas alleni (Wood) [part]. BANKS 1910:188.
Broteas alleni (Wood). KRAEPELIN 1899:176. EWING 1928:3, 6 [part]. HOFFMANN 1931:332–333. GERTSCH 1958:2–5. GERTSCH AND SOLEGLAD 1966:1. DIAZ-NAJERA 1970:113–114.
Nullibrotheas allenii (Wood). WILLIAMS 1974:2–13.

DIAGNOSIS.—Base color of cuticle golden-yellow with underlying dusky to dark markings on carapace and mesosomal dorsum; pedipalp with dark reddish-brown fingers; metasomal ventral keels with more or less distinct dusky stripes. Anterior margin of carapace usually with deep median emargination and rounded laterally; metasoma with ventromedian keels smooth to obsolete on segment I, crenulate to obsolete on segment II, crenular on segment III, serrate on segments IV and V; aculeus short, less than one-half length of vesicle; larger individuals normally with laterally swollen vesicle; pectinal teeth 6–9 in females, 10–14 in males; pedipalp fingers short, palm deep and swollen, keels obsolete to smooth except for pronounced ventral keel; pedipalp with movable finger shorter than carapace; fixed finger shorter than metasomal segment III.

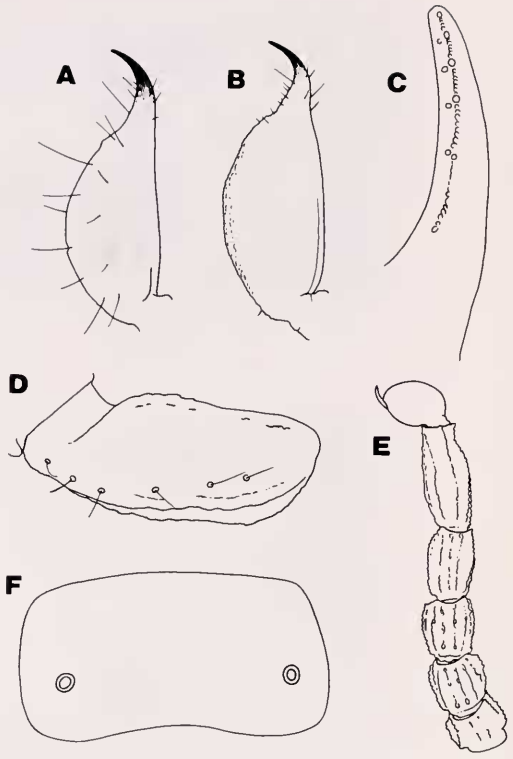

FIGURE 29. *Nullibrotheas allenii*, structural characteristics. (*A.*) Telson of female. (*B.*) Telson of male. (*C.*) Pedipalp fixed finger. (*D.*) Pedipalp brachium, ventral surface (note 6 trichobothria). (*E.*) Metasoma, ventral view (male). (*F.*) Mesosomal sternum showing stigma.

TYPE DATA.—*Scorpius allenii*, two cotypes (one male, one female): USNM, S-5 (Jar 2); Cabo San Lucas, Baja California Sur, Mexico. Male specimen (type S-5, Jar 2), designated lec-

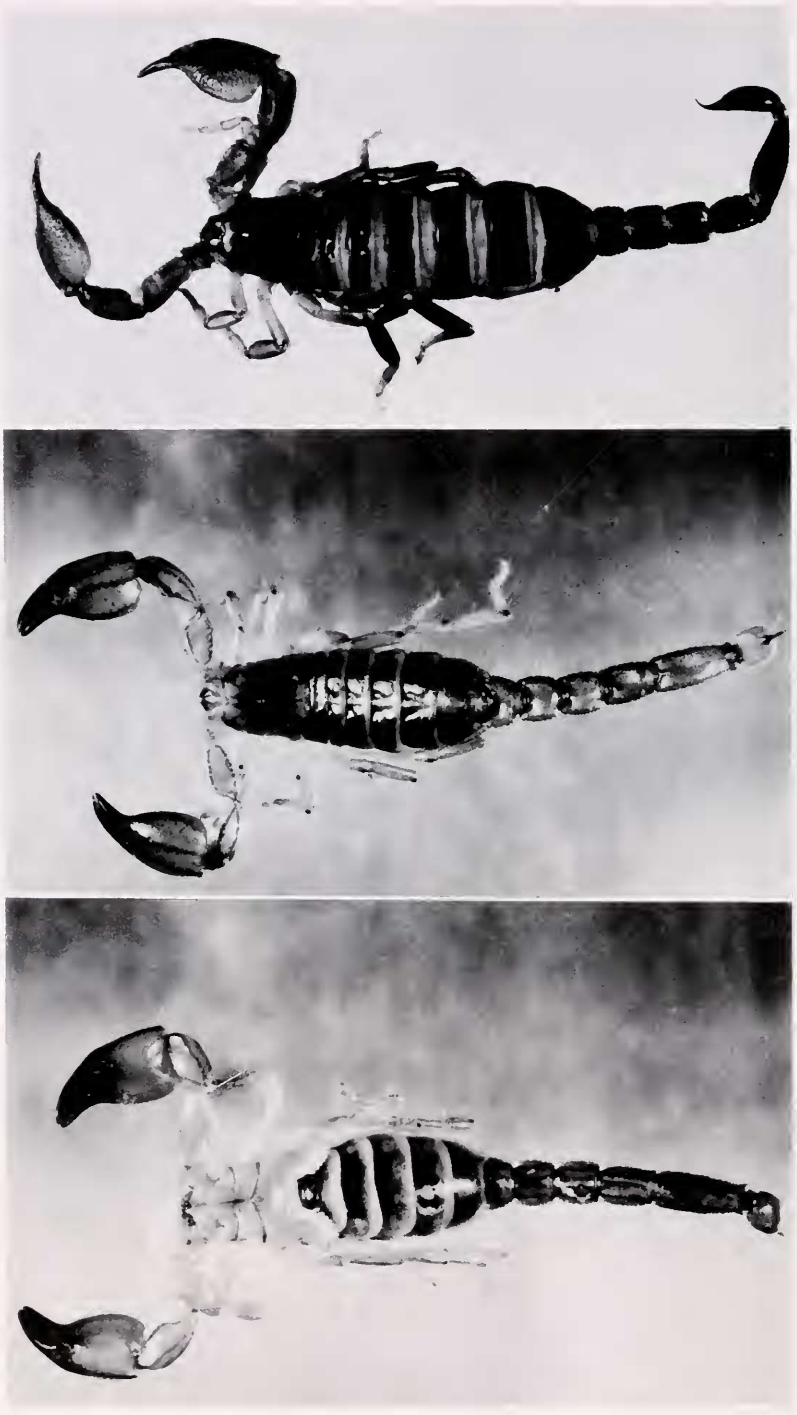

FIGURE 30. *Nullibrotheas allenii*, dorsal view of male (*upper*); dorsal view of female (*middle*); ventral view of female (*lower*).

FIGURE 31. Distribution of *Nullibrotheas alleni*.

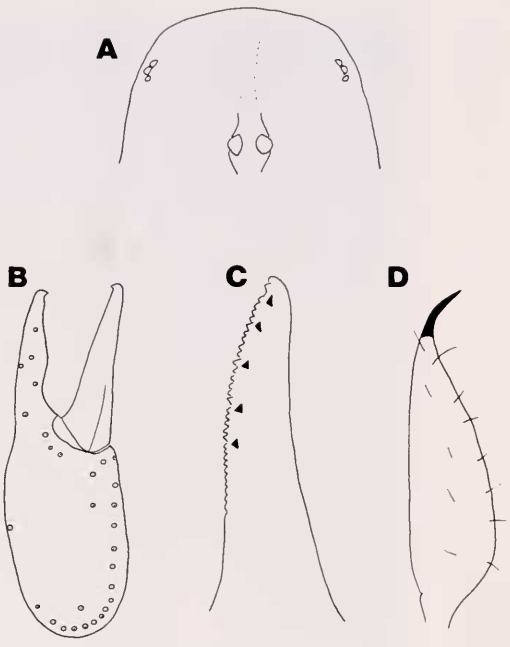

FIGURE 32. *Paravaejovis*, structural characteristics. (*A.*) Carapace showing ocelli and convex frontal margin. (*B.*) Pedipalp chela, retrolateral view showing trichobothria number and arrangement. (*C.*) Pedipalp fixed finger, prolateral view showing supernumerary granules. (*D.*) Telson of male showing typical shortening of aculeus.

totype by Gertsch (1958), location of female cotype unknown.

Uroctonus privus, holotype (juvenile female): ZMHU, East Berlin; "California, Graber collection."

DISTRIBUTION.—Bahía Concepción south to Cabo San Lucas, and associated islands.

REMARKS.—*Nullibrotheas allenii* is variable in coloration, cuticular granulation, hirsuteness, and body size. Throughout its range it forms local races with distinguished coloration, pattern, and size. For many years this species was considered to belong to the Chactidae, but recently it has been placed in the family Vaejovidae (Williams 1974).

Genus **Paravaejovis** Williams, new genus

(Figures 32, 33, 54N)

DESCRIPTION OF GENUS.—Carapace frontal margin convex; three lateral ocelli at each anterolateral corner of carapace; metasoma with ventromedian keels paired on segments I–IV; genital operculum completely divided in male, fused in female, males with one pair genital papillae; pectine with anterior lamellae, subcircular middle lamellae, subtriangular fulcra; chelicera similar to *Vaejovis* in structure, completely lacking denticles on ventral margin of movable finger; pedipalp fingers with primary denticles arranged in single row, this more or less subdivided into 4 or 5 subrows by slightly enlarged denticles, primary row of denticles flanked on prolateral side by 5 supernumerary granules on fixed finger, by 7 supernumerary granules on movable finger; pedipalp chela with 34 total trichobothria; ventral surface of pedipalp palm with conspicuous curved row of 15 trichobothria originating near movable-finger base and terminating on proximal retrolateral aspect of palm; pedipalp brachium with two trichobothria on ventral surface.

DIAGNOSIS.—Similar to *Vaejovis* and *Paruroctonus* but differs as follows: 34 trichobothria on the pedipalp chela (not 26–28); with conspicuous curved row of 15 trichobothria on ventral aspect of palm from movable-finger base to pos-

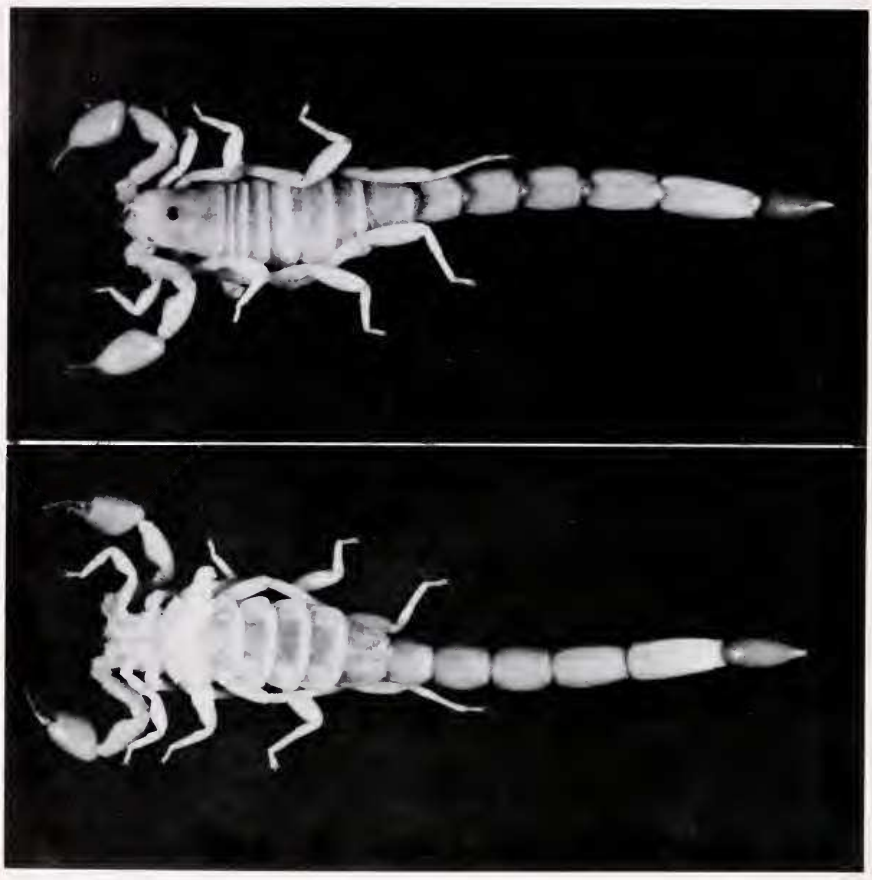

FIGURE 33. *Paravaejovis pumilis*, male, dorsal and ventral views.

terior retrolateral aspect of palm (this row trichobothria more or less degenerate in *Vaejovis* and *Paruroctonus*, not composed of more than 9 trichobothria).

TYPE-SPECIES.—*Vejovis pumilis* Williams.

REMARKS.—*Paravaejovis* is monotypic and endemic to the Magdalena Plain and southern Sierra Giganta regions of Baja California. *Paravaejovis* is placed within the subfamily Vaejovinae of the Vaejovidae.

Paravaejovis pumilis (Williams), new combination

(Figures 32–34, 54N)

Vejovis pumilis WILLIAMS, 1970b:297–302.
Paruroctonus pumilis (Williams), STAHNKE 1974a:138.

DIAGNOSIS.—Adults to 27 mm long. Base color uniform pale yellow, mature males with distinctive dark orange telson, both sexes with reddish pedipalp fingers. Pedipalp with short fingers, swollen palm; ratio of movable-finger length to carapace length 0.5–0.7; ratio of chela length to palm width 2.8–3.4; supernumerary granules 5 on fixed finger, 7 on movable finger. Pectine teeth 7–8 in females, 12–16 in males; pedipalp fixed finger with trichobothria *id* and *ip* on finger origin, directly above movable-finger articulation. Metasomal segment I as wide as or wider than long, segment II slightly longer than wide; ventrolateral keels crenulate to serrate on segments I–IV; ventromedian keels smooth to obsolete on I, smooth on II, smooth to crenulate on III and IV.

TYPE DATA.—*Vejovis pumilis*, holotype (male), allotype; CAS, Type No. 10425; 43.1 km W El Crucero, Baja California Sur, Mexico, 26–VII–1968, S. C. Williams, M. A. Cazier, J. Bigelow, M. Bentzien.

DISTRIBUTION.—San Raymundo south to a few kilometers north of La Paz.

FIGURE 34. Distribution of *Paravaejovis pumilis*.

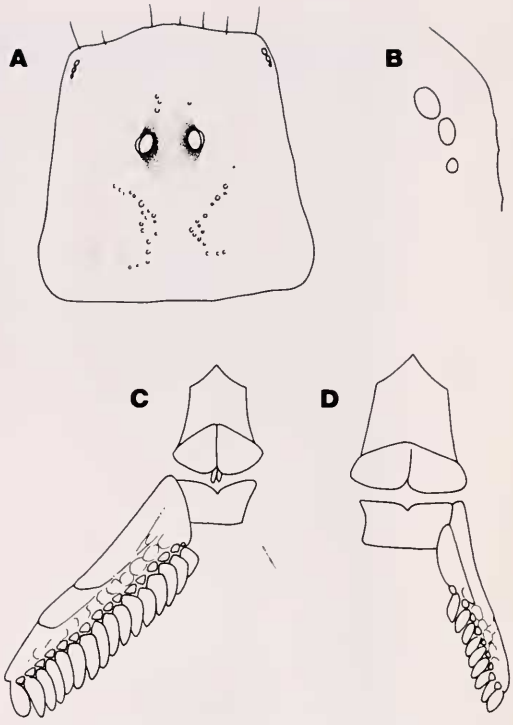

FIGURE 35. Structural characteristics of species of *Paruroctonus*. (*A.*) *Paruroctonus gracilior*, carapace showing three pairs of lateral ocelli, with anterior margin slightly convex. (*B.*) *Paruroctonus gracilior*, group of lateral ocelli. (*C.*) *Paruroctonus borregoensis*, male, pectine, genital operculum, genital papillae and prosomal sternum. (*D.*) *Paruroctonus borregoensis*, female, pectine, genital operculum, and sternum.

Genus **Paruroctonus** Werner

(Figures 35–37)

Paruroctonus is distinguished from other genera in Baja California as follows: anterior margin of carapace straight or slightly convex; lateral eyes 3 per group; openings to book lungs elongate to slitlike; metasoma with ventromedian keels paired or obsolete on segments I–IV; pectines with most middle lamellae composed of small, more or less equal-sized subcircular sclerites; fulcra subtriangular; genital operculum of male with conspicuous genital papillae; chelicerae with ventral margin of movable finger armed with small inconspicuous denticles or crenulations, these usually unpigmented; pedipalp fingers with single row of primary denticles, these flanked medially by supernumerary granules; pedipalp brachium with ventral surface with two trichobothria, these near posterior margin.

The genus *Paruroctonus* is similar to *Vaejovis* in structure. *Paruroctonus* may generally be distinguished by the chelicerae, in which the ventral margin of the movable finger is armed with one or more denticles or crenulations (these are sometimes very lowly developed and usually unpigmented and inconspicuous). Dorsal and dorsolateral keels of the metasoma terminate posteriorly in a rounded termination (not in a sharp or angular spine or denticle).

Some 21 species have been placed in the *Paruroctonus*. All are from North America, the majority in desert habitats of the Mojave, Colorado, and Sonoran deserts. Ten species have been collected in northern Baja California and in adjacent regions.

KEY TO THE *PARUROCTONUS* OF BAJA CALIFORNIA AND ADJACENT AREAS

1. Space between ventromedian keels of metasoma with abundant, stout, reddish setae, segment III often with more than 10 such setae (Fig. 37*D*) 2

Space between ventromedian keels of me-

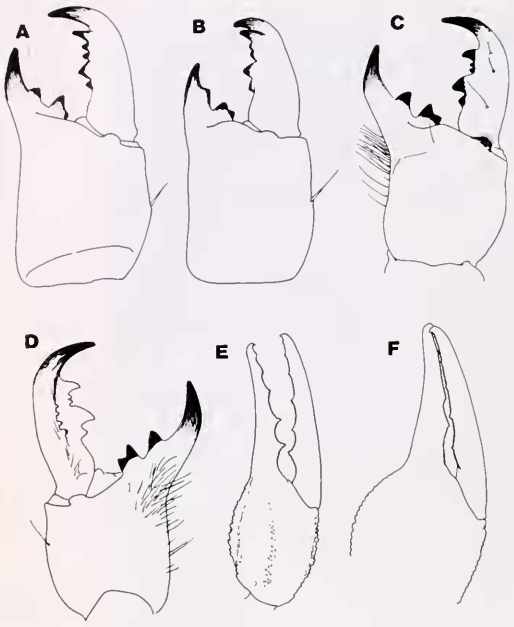

FIGURE 36. Structural characteristics of species of *Paruroctonus*. (*A.*) *Paruroctonus luteolus*, chelicera, dorsal view. (*B.*) *Paruroctonus borregoensis*, chelicera, dorsal view. (*C.*) *Paruroctonus gracilior*, chelicera, dorsal view. (*D.*) *Paruroctonus gracilior*, chelicera, ventral view. (*E.*) *Paruroctonus xanthus*, pedipalp chelicera, retrolateral view (note internal scalloping of fingers). (*F.*) *Paruroctonus arnaudi*, retrolateral view.

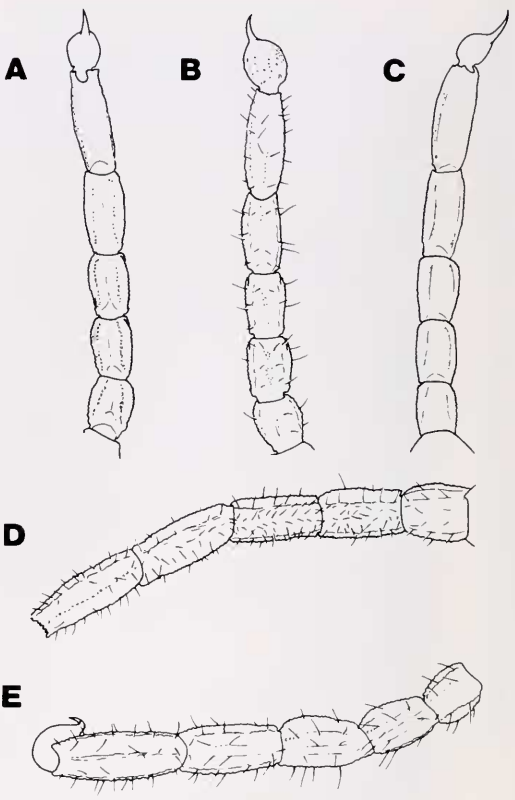

FIGURE 37. Structural characteristics of species of *Paruroctonus*. (*A.*) *Paruroctonus luteolus*, metasoma, dorsal view. (*B.*) *Paruroctonus luteolus*, metasoma, ventral view. (*C.*) *Paruroctonus borregoensis*, metasoma, dorsal view (note reduction of granulation of dorsal keels). (*D.*) *Paruroctonus mesaensis*, ventral view of metasoma (note numerous ventral setae). (*E.*) *Paruroctonus xanthus*, ventral view of metasoma (note lack of setae between ventromedian keels).

tasoma lacking abundant reddish setae, such setae usually completely absent (Fig. 37*E*) 3

2(1). Dorsum of mesosoma with more or less distinct dark or dusky underlying markings; ventromedian keels of metasoma irregularly crenulate on segments I through III ..... *P. grandis*

Dorsum of mesosoma pale yellow and completely lacking dusky, olive, or other dark coloration; ventromedian keels of metasoma obsolescent on segment I, these smooth on segments II and III ..... *P. mesaensis*

3(1). Pectine teeth 24 or more on males, 17 or more on females 4

Pectine teeth 23 or fewer on males, 15 or fewer on females 6

4(3). Pedipalp fixed finger distinctly longer than palm ..... *P. xanthus*

Pedipalp fixed finger usually distinctly shorter than palm, at most with fixed finger equal to palm in length 5

5(4). Pedipalp of adult male with distinct proximal open space between fingers when chela closed; interocular region of carapace lacking melanic pigmentation ..... *P. arnaudi*

Pedipalp of adult male without distinct proximal open space between fingers when chela closed; interocular region of carapace with melanic pigmentation ..... *P. silvestrii*

6(3). Ventral margin of fixed cheliceral finger with one to three small denticles opposite biscusp denticle of finger 7

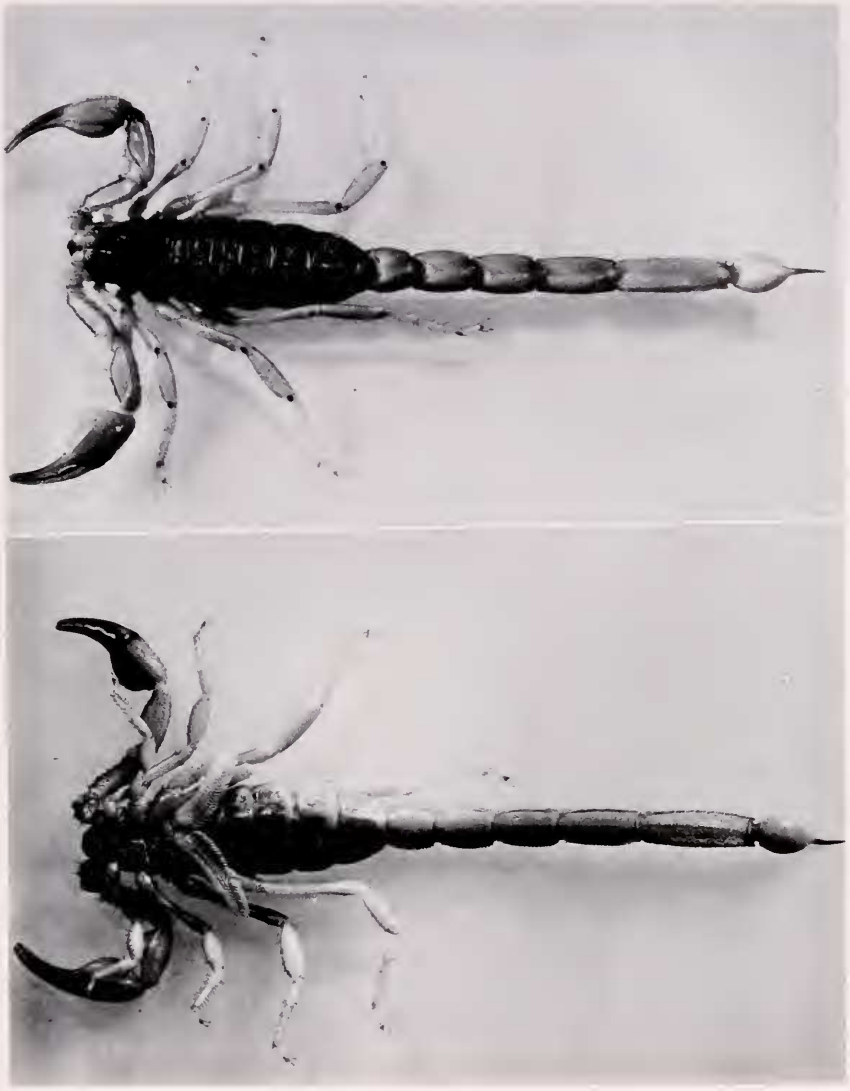

FIGURE 38. *Paruroctonus arnaudi*, holotype, male, dorsal and ventral views.

Ventral margin of fixed cheliceral finger lacking denticles 8

7(6). Metasoma of females with dorsal and dorsolateral keels weakly developed and faintly crenulate (Fig. 37*C*); ratio of pedipalp chela length to palm width usually 1.45 or less in adult males; male metasomal setae greatly reduced and inconspicuous ..... *P. borregoensis*

Metasoma of females with dorsal and dorsolateral keels well developed and strongly crenulate to serrate, definitely more crenulate than smooth (Fig. 37*A*); ratio of pedipalp chela length to palm width usually greater than 1.45 in adult males; males with long, conspicuous metasomal setae ..... *P. luteolus*

8(6). Six supernumerary granules on fixed pedipalp finger ..... *P. surensis*, new species

Five supernumerary denticles on fixed pedipalp finger 9

9(8). Carapace, terga, and metasoma with ex-

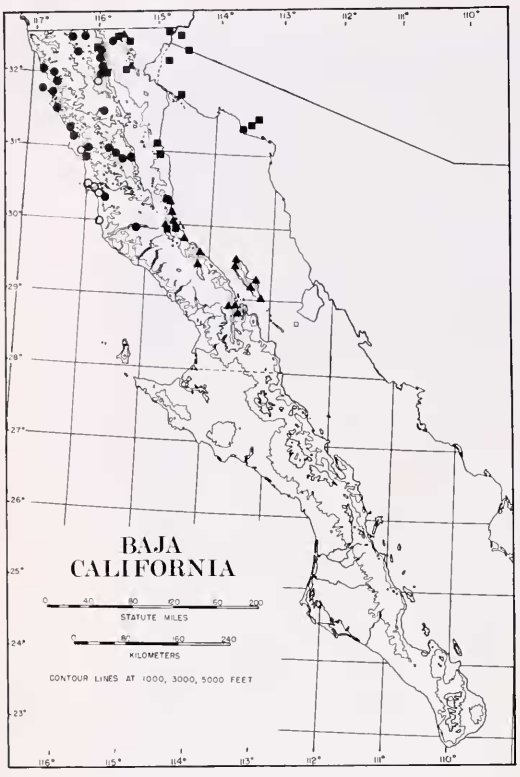

FIGURE 39. Distribution of *Paruroctonus arnaudi* (open circles), *P. grandis* (triangles), *P. mesaensis* (squares), and *P. silvestrii* (closed circles).

tensive fuscous markings; movable pedipalp finger distinctly longer than humerus on males ..... *P. ventosus*

Contrasting fuscous markings lacking, entirely uniform pale yellow; movable pedipalp finger distinctly shorter than humerus on males ..... *P. pseudopumilis*

Paruroctonus arnaudi Williams

(Figures 38, 39)

Paruroctonus arnaudi WILLIAMS, 1972:4–5.

DIAGNOSIS.—Basic color of cuticle golden-yellow with distinctive dusky to dark marbling on carapace and mesosomal dorsum; ventral keels of metasoma usually with dusky outline; pedipalp finger same color as palm; pedipalp palms swollen, strongly granular keels; pedipalp fingers moderately scalloped, male with distinctive open proximal space when fingers closed; pectine teeth 21–25 in females, 26–31 in males; space between ventromedian keels of metasoma without abundant, stout, reddish setae, segment III with fewer than 10 such setae; pedipalps with fixed finger equal to or shorter than palm in length.

Similar to *P. grandis* and *P. silvestrii*. Distinguished from *P. grandis* as follows: metasomal segments not as elongate; with dusky outlining of ventral metasomal keels; pedipalp fingers of male more deeply scalloped and with larger open proximal space when fingers closed; space between ventromedian metasomal keels not hirsute. Distinguished from *P. silvestrii* as follows: males with distinctive proximal space when pedipalp fingers closed; pedipalp palm ventrally not conspicuously granular; not as darkly marked.

TYPE DATA.—*Paruroctonus arnaudi*, holotype (male), allotype: CAS Type No. 11334; Socorro Sand Dunes, Baja California Norte, Mexico, 12–VII–1969, S. C. Williams, V. F. Lee.

DISTRIBUTION.—Sandy coastal habitats of northwest Baja California.

NEW RECORDS.—**Baja California Norte, Mexico:** 19 km N Rancho El Topo, 16–VII–1969 (Williams, Lee); 2.6 km W Colonia Guerrero, 16–VII–1962 (Parrish); Punta Baja, 2–IX–1963 (Schwenkmeyer).

Paruroctonus borregoensis Williams

(Figures 36*B*, 37*C*, 40, 41)

Paruroctonus borregoensis WILLIAMS, 1972:5–6.

DIAGNOSIS.—Adults to 35 mm long; body entirely pale whitish yellow, without contrasting dark or dusky markings. Ventrolateral keels of metasomal segments I–IV crenular, ventromedian keels obsolete on segment I, lightly crenular on segments II and III; male pedipalps with short fingers, palms greatly swollen; pectine teeth 15–18 in males, 11 in females; space between ventromedian keels of metasoma lacking abundant, stout, reddish setae, segment III with fewer than 10 setae; pedipalp fixed finger distinctly shorter than palm.

Similar to *P. luteolus* but differs as follows: metasoma with dorsal keels not as strongly developed and not as crenulate in females; males with more granular pedipalp chela; ratio of pedipalp-chela length to palm width usually 1.45 or less in adult males; male metasomal setae greatly reduced and inconspicuous.

TYPE DATA.—*Paruroctonus borregoensis*, holotype (male), allotype: CAS, Type No. 11336; 21 km NE Borrego Springs, San Diego County, California, 7–X–1967, M. A. Cazier.

FIGURE 40. *Paruroctonus borregoensis*, holotype, male, dorsal and ventral views.

DISTRIBUTION.—Northeastern desert region of Baja California; southern California and Arizona deserts.

NEW RECORDS.—**Arizona:** Yuma Co., San Luis, 22–VII–1967 (Cazier). **Baja California Norte, Mexico:** N end Laguna Salada, 31–III–1969 (Williams). **Sonora, Mexico:** 8.0 km N El Golfo, 5–VI–1968 (Cazier); 10.5 km N Puerto Peñasco, 3–VI–1968 (Cazier).

Paruroctonus grandis (Williams)

(Figures 39, 42)

Vejovis grandis WILLIAMS, 1970b:277–281.
Paruroctonus grandis (Williams). WILLIAMS 1972:3. STAHNKE 1974:138.

DIAGNOSIS.—Adults to 80 mm long; base color of carapace, mesosoma, metasoma, pedipalps, and walking legs uniform bright yellow; carapace with underlying intricate, dark color pattern; mesosomal terga with dark underlying markings, posterior terga with dark markings more faded and not as extensive; pedipalp fingers reddish brown in adults. Ventrolateral keels irregularly serrate to deeply crenulate; ventromedian keels irregularly crenulate on segments I–III, irregularly crenulate to serrate on IV; space between ventrolateral keels on segments I–IV densely covered with stout reddish bristles, these very conspicuous.

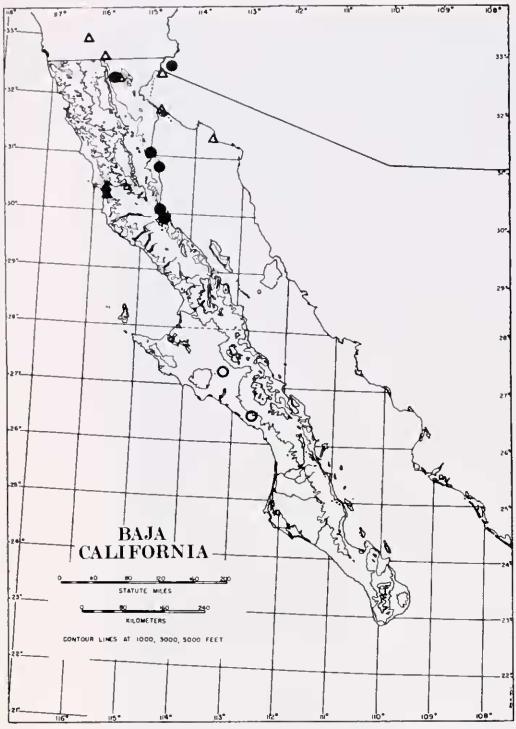

FIGURE 41. Distribution of *Paruroctonus borregoensis* (open triangles), *Paruroctonus luteolus* (closed circles), *Paruroctonus surensis* (open circles), and *Paruroctonus ventosus* (closed triangles).

Similar to *P. vachoni* and *P. mesaensis*, but differs from *P. mesaensis* as follows: dark dorsal markings, presence of red pedipalp fingers. Differs from *P. vachoni* as follows: telson more elongate and less swollen, vesicle with hairs longer and less bristlelike in males; pedipalp chela without deep, conspicuous, double-dentate proximal scallop.

TYPE DATA.—*Vejovis grandis*, holotype (male), allotype: CAS, Type No. 10417; Oakie Landing, 43 km S Puertecitos, Baja California, Mexico, 12–VI–1968, S. C. Williams, M. A. Cazier.

DISTRIBUTION.—Northeastern desert regions from Mexicali south to Punta Trinidad, and following islands: Méjia, Ángel de la Guarda, Pond, and Estanque.

NEW RECORDS.—**Baja California Norte, Mexico:** 8.0 km W Colonia Progreso, 8–VII–1969 (Williams, Lee); 6.4 km N Río Hardy Fish Camp, 19–VII–1969 (Williams, Lee); 4.8 km N El Mármol, 27–III–1956 (Wood, SDMNH); Agua de Higuera, 21–II–1969 (Snelling, LACM); 19.6 km E San Borja, 24–XI–1961 (Parrish); Isla Méjia (E side), 16–IV–1962 (Campbell); Isla Ángel de la Guarda, 25–VI–1961 (Soule, Parrish); Isla Estanque, 13–III–1971 (Lee); Punta Trinidad, 20–III–1971 (Lee).

REMARKS.—This species was found only along the eastern side of Baja California in rocky volcanic habitats where considerable soil had accumulated. It forms local color races throughout its distribution, being dark on dark soils and lighter on light soils.

Paruroctonus luteolus (Gertsch and Soleglad)

(Figures 36*A*, 37(*A*, *B*), 41, 43)

Vejovis luteolus GERTSCH AND SOLEGLAD, 1966:40–42.
Paruroctonus luteolus (Gertsch and Soleglad). WILLIAMS 1971:3. STAHNKE 1974:138.
Paruroctonus bajae WILLIAMS, 1972:6–7. New synonym.

DIAGNOSIS.—Adults to 30 mm long. Entire body light yellow to orange-brown, no contrasting dark color patterns; females with terga and carapace smooth and lustrous, males somewhat more granular and less lustrous. Metasoma with dorsal and dorsolateral keels not prominent, these smooth; ventrolateral keels more or less obsolete on segments I and II, visible and weakly crenulate on posterior of segment III, more distinct and with weak granules on posterior region of segment IV; metasoma with ventromedian keels of segments I–III obsolete, on segment IV faintly visible and weakly crenulate; pectine teeth 11–15 in females, 16–19 in males; chelicera with ventral margin of movable finger lightly crenulated, ventral margin of fixed finger with traces of two weak nodules.

TYPE DATA.—*Vejovis luteolus*, holotype (female): AMNH; 3.2 km E of Anza-Borrego State Park on highway 78, San Diego County, California, 22–IV–1960, W. J. Gertsch.

Paruroctonus bajae, holotype (male): CAS, Type No. 11335; 13 km N Bahía San Luis Gonzaga, Baja California Norte, Mexico, 13–VI–1968, S. C. Williams, M. A. Cazier.

DISTRIBUTION.—Baja California Norte, northeastern desert region from Bahía San Luis Gonzaga north to United States border; California and Arizona deserts.

NEW RECORDS.—**Baja California Norte, Mexico:** W side Laguna Salada, II–1963 (Barr); San Felipe, 8–VI–1968 (Williams, Cazier); Persebú, 23–VI–1973 (Williams, Blair); Oakie Landing, 12–VI–1968 (Williams, Cazier); 13 km N Bahía San Luis Gonzaga, 13–VI–1968 (Williams, Cazier).

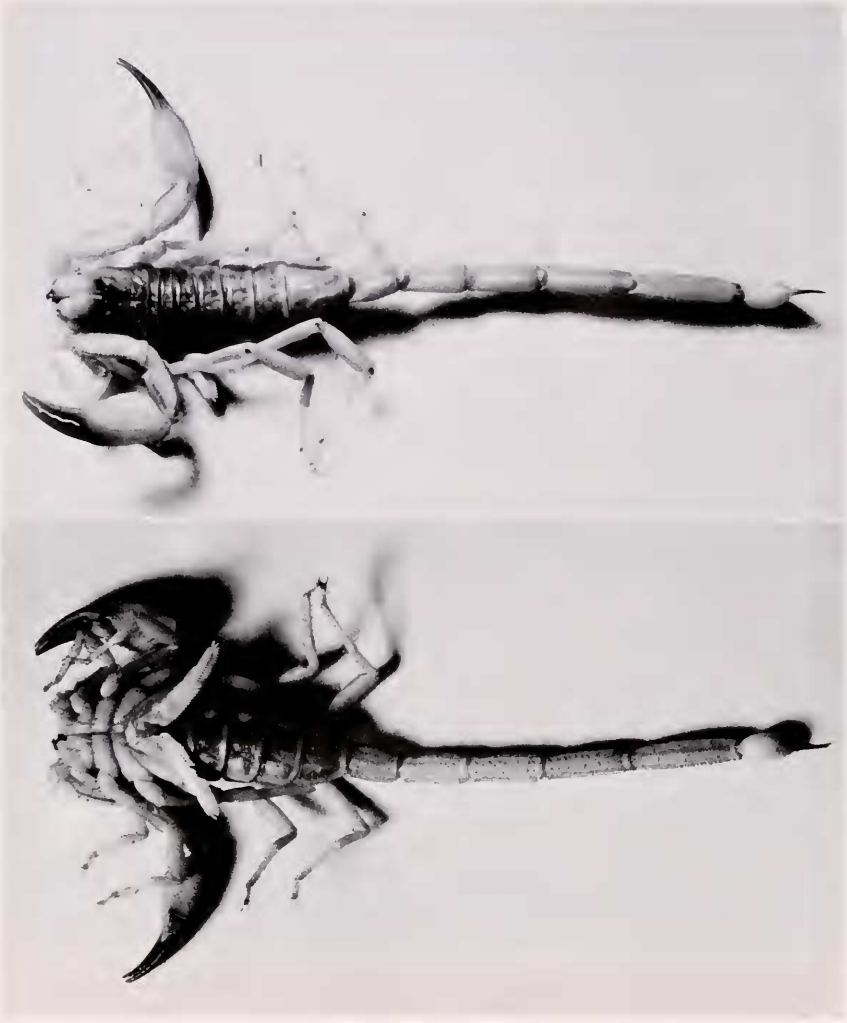

FIGURE 42. *Paruroctonus grandis*, topoparatype, male, dorsal and ventral views.

Paruroctonus mesaensis Stahnke

(Figures 37*D*, 39, 44)

Paruroctonus mesaensis STAHNKE, 1957:253–259. GERTSCH 1958:15. STAHNKE 1961:207. GERTSCH AND ALLRED 1965:9. WILLIAMS 1972:3. STAHNKE 1974:138.

Vejovis (Paruroctonus) mesaensis (Stahnke). GERTSCH AND SOLEGLAD 1966:35. WILLIAMS AND HADLEY 1967:113–114.

DIAGNOSIS.—Adults to 70 mm long. Body pale orange in juveniles to pale yellow in adults, contrasting dark color patterns lacking; carapace equal to or slightly shorter than movable pedipalp finger; metasoma with ventrolateral keels irregularly granular, ventromedian keels obsolete on segment I, smooth on segments II and III, crenular on IV; space between ventromedian keels with numerous, conspicuous, reddish setae; chelicerae with 3–5 small unpigmented denticles on ventral margin of movable finger; pectine teeth 23–25 in females, 32–39 in males.

Similar to *P. vachoni* and *P. grandis*. Distinguished from *P. vachoni* as follows: lack of dark dorsal markings, lack of reddish pedipalp fingers in adults. Distinguished from *P. grandis* as follows: lack of dark dorsal markings, ventromedian keels of metasoma obsolete on segment I and smooth on segments II and III (not crenulate on segments I–III).

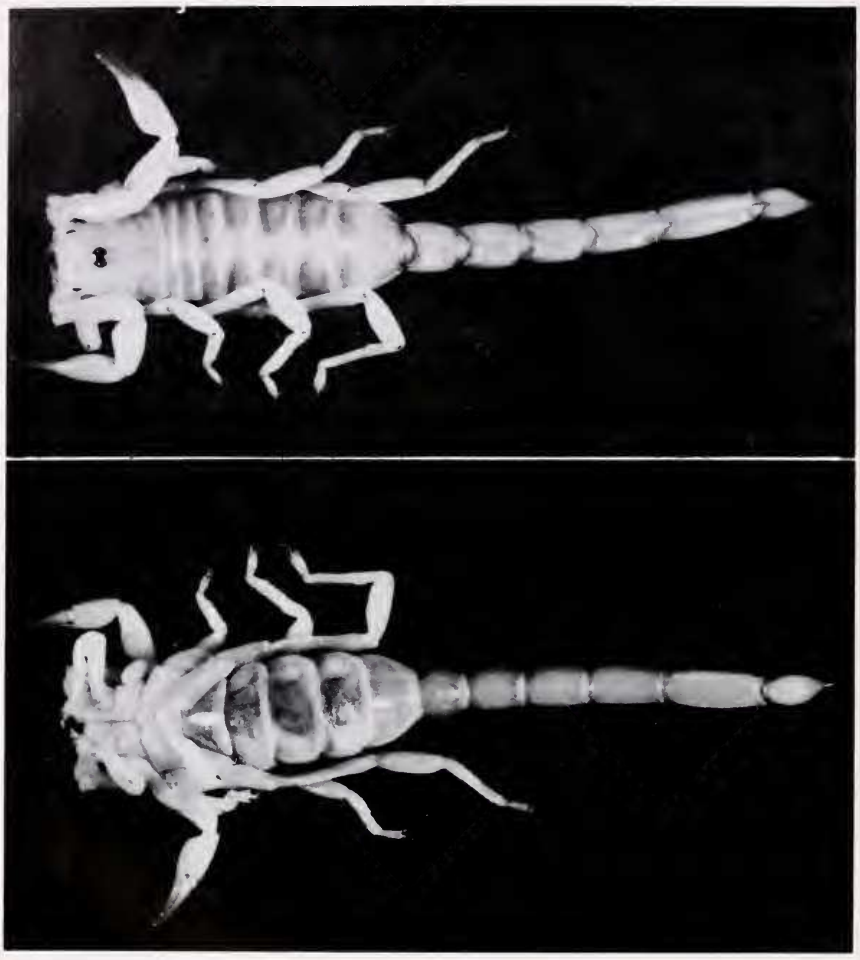

FIGURE 43. *Paruroctonus luteolus*, male, dorsal and ventral views.

TYPE DATA.—*Paruroctonus mesaensis*, holotype (female): H. L. Stahnke collection; NW of Mesa, Maricopa County, Arizona.

DISTRIBUTION.—Baja California, from United States border to Bahía San Luis Gonzaga and Jaraguay Summit; deserts of Sonora, California, Arizona.

NEW RECORDS.—**Baja California Norte, Mexico:** Algodones, 18–VII–1969 (Williams, Lee); 34 km E La Rumorosa, E base Sierra Juárez, 8–VII–1969 (Williams, Lee); 8.0 km W Colonia Progreso, 8–VII–1969 (Williams, Lee); 26.9 km S Mexicali, 16–VII–1961 (Parrish); Laguna Salada, near base Canyon Tajo, 2–IV–1969 (Williams, Heringhi); 6.4 km N Rio Hardy Fish Camp, 19–VII–1969 (Williams, Lee); San Felipe, 8–VI–1968 (Williams, Cazier); Persebú, 23–VI–1973 (Williams, Blair); Sulfur Mine N Puertecitos, 4–IV–1973 (Szerlip, CIS); Bahía San Luis Gonzaga, 3–IV–1973 (Szerlip, CIS); Jaraguay Summit, 1973 (CIS).

REMARKS.—Prefers sand-dune habitats and is well adapted to travel over unconsolidated dune sand. It is often a dominant element in the scorpion community of sand dunes. Information about the bionomics of this species has been published (Williams and Hadley 1967; Hadley and Williams 1968).

Paruroctonus pseudopumilis (Williams)

(Figures 41, 45)

Vejovis pseudopumilis WILLIAMS, 1970d:181–183.
Paruroctonus pseudopumilis (Williams). STAHNKE 1974a:138.

DIAGNOSIS.—Adults to about 27 mm long. Base color of body uniform pale yellow, pedipalp fingers light pink, telson light amber. Carapace anterior border convex. Metasoma ventrolateral keels smooth to faintly crenulate on

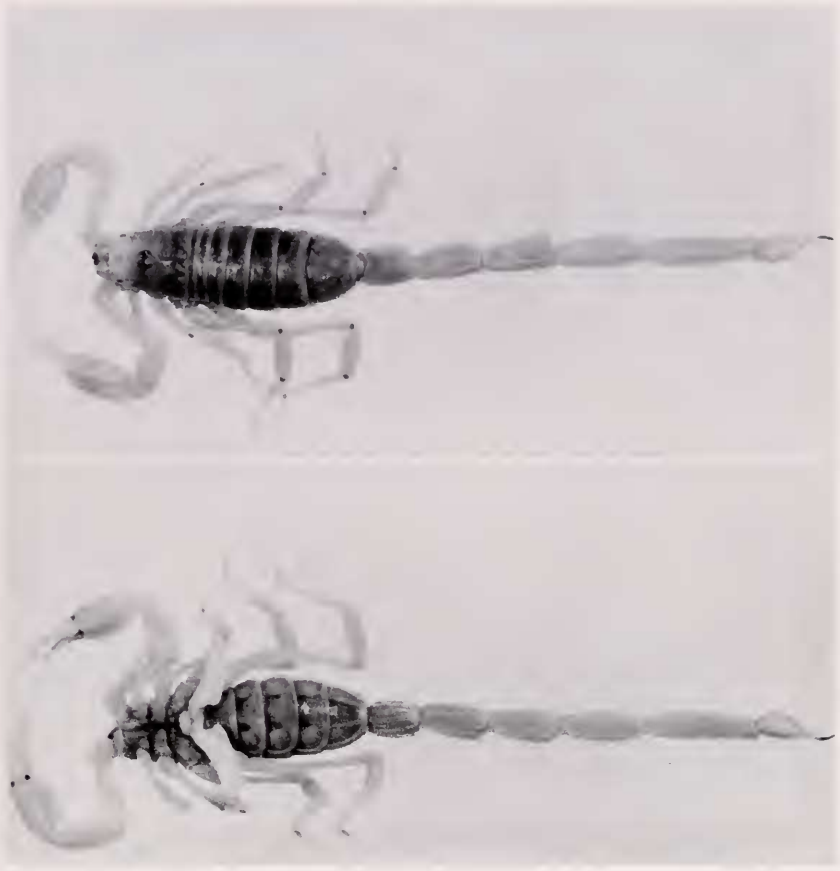

FIGURE 44. *Paruroctonus mesaensis*, topotype, male, dorsal and ventral views.

segments I–III, irregularly crenulate on IV, ventromedian keels on segments I–III smooth, smooth to faintly crenulate on IV; segment I as long as or slightly longer than wide, segment II distinctly longer than wide, segment V 2.8–2.9 times longer than wide. Pedipalps with short fingers, palms moderately swollen; ratio of movable-finger length to carapace length 0.5–0.6 in males; ratio of movable-finger length to palm width 1.4–1.5 in males; ratio of chela length to palm width 2.9–3.1 in males; 5 supernumerary granules on fixed finger, 7 on movable finger. Pectine teeth 18 in males.

TYPE DATA.—*Vejovis pseudopumilis*, holotype (male): CAS, Type No. 10424; San Ángel, 21 km W San Ignacio, Baja California Sur, Mexico, 28–VI–1968, S. C. Williams, M. A. Cazier.

DISTRIBUTION.—Vizcaíno Desert south to San Raymundo.

NEW RECORD.—**Baja California Sur, Mexico:** 13 km N San Raymundo, 30–VI–1968 (Williams, Cazier).

Paruroctonus silvestrii (Borelli)

(Figures 39, 46)

Vejovis silvestrii BORELLI, 1908:225–227. EWING 1928:14.
Vejovis boreus (Girard) [part]. GERTSCH 1958:6.
Vejovis (Paruroctonus) silvestrii Borelli. GERTSCH AND SOLEGLAD 1966:15–20.
Paruroctonus silvestrii (Borelli). WILLIAMS 1972:3.

DIAGNOSIS.—Dorsal surface of carapace and mesosoma with underlying dusky or dark markings, dusky markings continuous to posterior margin of each mesosomal tergum; position of ventromedian and ventrolateral keels of metasoma with underlying dusky or dark markings; base color of cuticle dull orange or yellow. Metasoma with ventrolateral keels weakly developed and smooth, ventromedian keels obsolete, position of ventromedian keels of segments I–

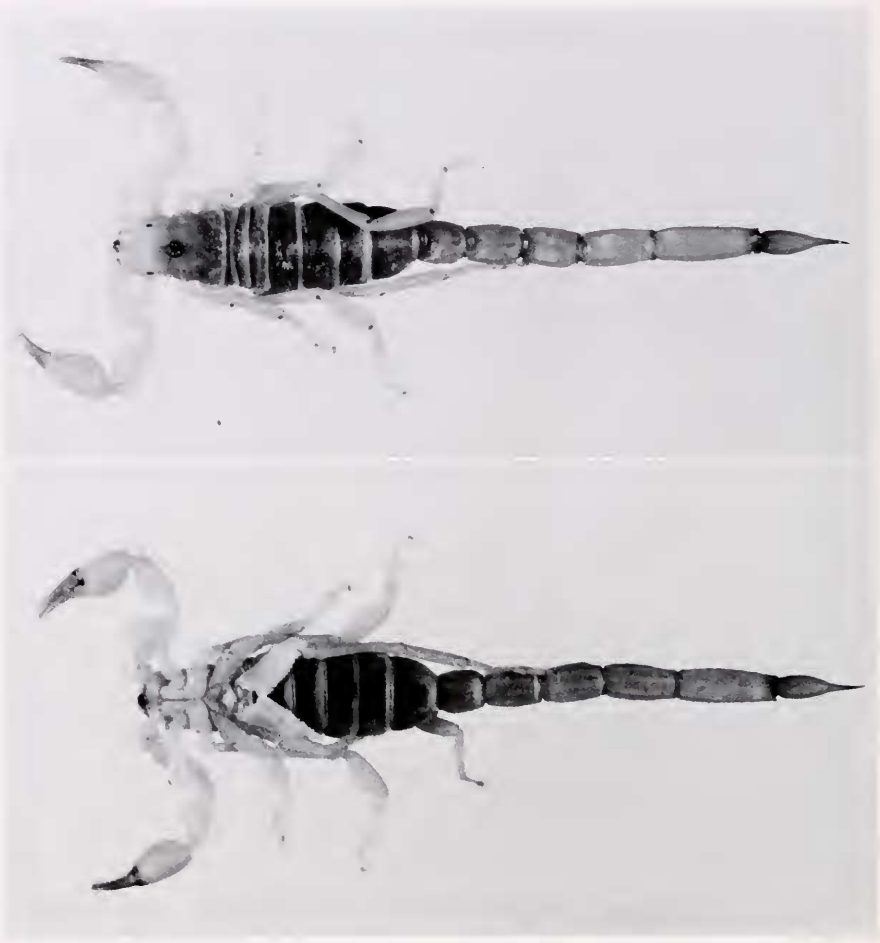

FIGURE 45. *Paruroctonus pseudopumilis*, holotype, male, dorsal and ventral views.

IV set with 3, 4, 4, 5 pairs of setae, respectively; chelicera with ventral margin of fixed finger usually with 2 distinct, dusky denticles at base; ventral margin of movable finger with about 4–7 irregular denticles; pectine teeth 18–22 in females, 25–29 in males.

Similar to *P. arnaudi*, but distinguished by obsolete ventromedian metasomal keels (not smooth to lightly crenulate).

TYPE DATA.—*Vejovis silvestrii*, holotype (female): Museo Zoologico, Turin; Sierra Madre, Los Angeles County, California.

DISTRIBUTION.—Baja California, from Tecate south to El Progreso; southern and central California.

NEW RECORDS.—**Baja California Norte, Mexico:** 4.8 km S Mexicali–Tecate hwy., Sierra Juárez, 20–VI–1973 (Williams, Blair); 16.6 km SW Rumorosa, 25–VII–1963 (LBS); El Progreso, head of El Tajo Canyon, 12–IX–1958 (Truxal, LACM); Sierra Juárez, Sawmill, 9–VII–1969 (Williams, Lee); Laguna Hanson, 7–X–1938 (Meadows, LACM); 18 km SE Ojos Negros, 15–VII–1969 (Williams, Lee); 19 km E Ensenada, 15–VII–1969 (Williams, Lee); NE slope N Los Coronados Islands, 20–VI–1961 (Farmer); between Rancho Filipinas and Rancho Viejo, 30–VI–1962 (Lindsay); Punta Banda, 10–VII–1969 (Williams, Lee); Puerto Santo Tomás, 11–VII–1969 (Williams, Lee); 0.8 km W La Milla Ruins, Sierra Juárez, 21–VI–1973 (Williams, Blair); 2.6 km N Punta Calaveras, Hematite Mine, 13–VII–1962 (Parrish); Arroyo Seco, 9–II–1964 (Allen, Croulet); 26 km E Meling Ranch, Sierra San Pedro Mártir, 13–VII–1969 (Williams, Lee); La Grulla, Sierra San Pedro Mártir, 5–IX–1961 (Parrish, Lindsay, Sloan); Mike's Sky Ranch, Sierra San Pedro Mártir, 14–19–VI–1973 (Williams, Blair); SW side La Encantada Meadow, Sierra San Pedro Mártir, 5–IX–1961 (Parrish); 0.5 km SW Socorro, San Pedro Mártir foothills, 2–IX–1961 (Parrish); 8.0 km N Colonia Guerrero, 23–VIII–1961 (Parrish); El Progreso, 1–IV–1969 (Williams).

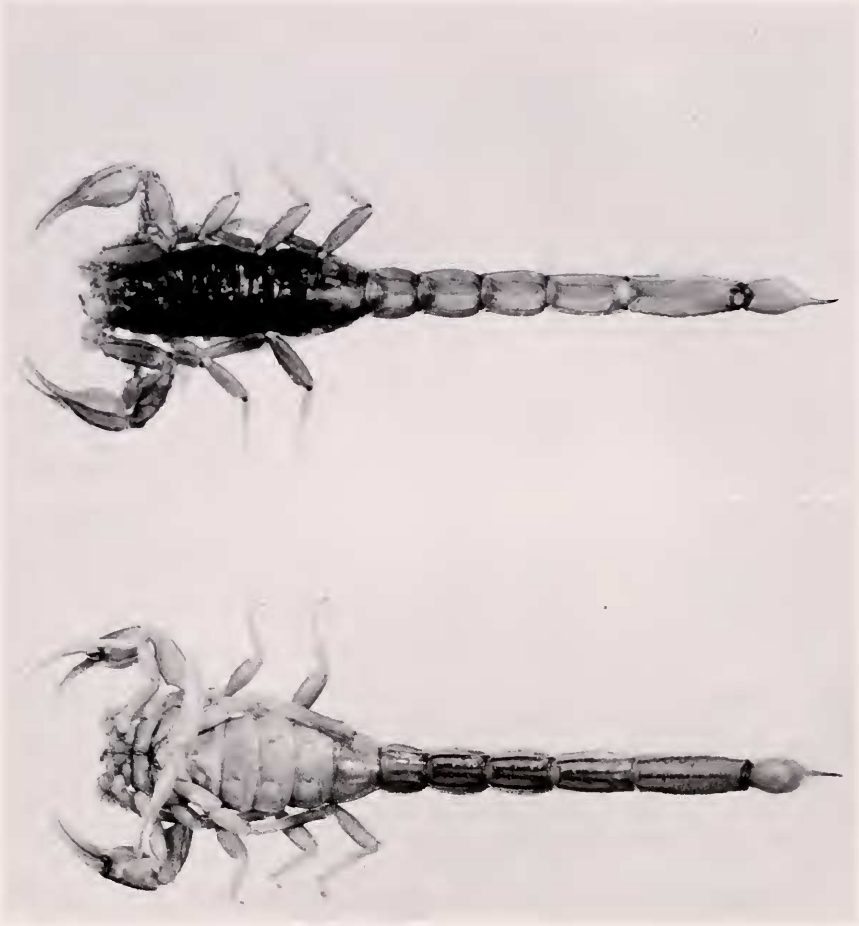

FIGURE 46. *Paruroctonus silvestrii*, male, dorsal and ventral views.

REMARKS.—One of the most abundant scorpions in the higher elevations of the northern parts of the Baja California. It occupies a wide variety of ecological conditions, but is generally not found east of the Sierra Juárez and Sierra San Pedro Mártir. Commonly encountered in coastal sand dunes, chaparral foothills, oak-grassland, and coniferous forests.

Paruroctonus surensis Williams and Haradon, new species
(Figures 41, 47; Tables 1, 2)

DIAGNOSIS.—Pale yellow base color with pigmented interocular space on carapace. Pectine teeth 17–19 in males, 8–9 in females. Pedipalp fingers short, fixed finger shorter than palm, with 6 and 7 interior supernumerary granules on fixed and movable fingers, respectively.

Similar to *P. borregoensis* and *P. pseudopumilis*. Differs from *P. borregoensis* as follows: denticles absent (not with 1 or 2) on ventral margin of fixed cheliceral finger; interocular dusky pigmentation on carapace; proximal digital scalloping on chela of male reduced (does not form distinct gap when closed); chela less stout, ratio of palm length to width greater than 1.50 (not 1.45 or less).

Differs from *P. pseudopumilis* as follows: 7 (not 6) interior supernumerary granules on movable pedipalp finger; attains slightly larger adult size; metasomal setae on males greatly reduced (not long and conspicuous).

DESCRIPTION OF HOLOTYPE.—**Male.** Extensive light dusky markings in interocular area of carapace; pedipalp fingers orange-yellow, darker than palms; cuticle otherwise pale yellow.

TABLE 1. COMPARISON OF MEASUREMENTS (MM) AND COUNTS OF HOLOTYPES OF THIRTEEN NEW SPECIES OF BAJA CALIFORNIA SCORPIONS, GENUS *Paruroctonus* AND *Vaejovis*.

	Paruroctonus surensis	*Vaejovis pattersoni*	*Vaejovis adcocki*	*Vaejovis armadentis*	*Vaejovis bechteli*	*Vaejovis dwyeri*	*Vaejovis gigantaensis*
Sex — Total Length	♂–32.9	♂–20.5	♂–39.5	♂–28.9	♀–32.5	♂–22.0	♂–21.0
Carapace, length/width (at med. eyes)	4.4/3.5	2.7/2.0	4.8/3.5	3.7/0.4	3.7/2.6	2.8/2.0	2.6/1.9
Diad (w/frontal margin distance)	0.9/1.9	0.5/1.0	2.5/1.7	0.4	0.4/1.3	0.3/0.9	0.3/1.0
Metasoma, length	16.6	8.5	18.4	13.1	11.9	9.3	8.9
Segment I (length/width)	2.4/2.2	1.2/1.8	2.6/2.9	1.8/2.0	1.6/2.0	1.2/1.2	1.2/1.6
Segment II (length/width)	2.8/2.1	1.3/1.8	2.9/2.8	2.0/2.0	1.8/1.8	1.5/1.2	1.4/1.6
Segment III (length/width)	2.9/2.0	1.5/1.8	3.2/2.7	2.3/2.0	2.0/1.8	1.6/1.1	1.5/1.6
Segment IV (length/width)	3.5/1.8	1.8/1.9	4.1/2.7	2.8/2.0	2.6/1.7	2.1/1.2	2.0/1.6
Segment V (length/width)	5.0/1.8	2.7/1.9	5.6/2.5	4.2/1.8	3.9/1.7	2.9/1.1	2.8/1.6
Telson, length	5.0	2.6	5.0	3.9	4.0	2.6	2.5
Vesicle (length/width/depth)	3.0/1.4/1.2	1.9/1.3/0.8	3.3/2.3/1.7	2.5/1.6/1.2	2.7/1.8/1.4	1.7/1.0/0.7	1.6/1.1/0.8
Aculeus, length	2.0	0.7	1.7	1.2	1.3	0.9	0.9
Pedipalp							
Humerus (length/width)	3.4/1.2	2.1/0.7	4.7/1.3	3.4/1.0	3.4/0.9	2.6/0.8	2.4/0.6
Brachium (length/width)	3.9/1.6	2.4/0.9	5.0/1.5	3.5/1.2	3.6/1.0	2.8/0.9	2.6/0.7
Chela, length	5.8	3.8	7.9	5.9	5.9	4.8	3.9
Palm (length/width/depth)	3.6/1.8/1.9	2.1/1.2/1.2	3.6/1.7/2.0	2.9/0.9/2.0	2.2/1.2/1.4	2.3/1.3/0.9	1.4/0.7/0.8
Movable finger (length, base)	3.3/1.7	2.3/0.6	5.2/0.8	3.2/0.8	3.8/0.7	2.8/2.5	2.6/0.4
Fixed finger, length	2.2	1.7	4.3	3.0	3.2	2.5	2.2
Supernumerary denticles (FF/MF)	7/6	7/6	6/7	6/7	6/7	6/7	6/7
Fixed finger primary denticles	5	5	50	43	47	44	35
Fixed finger, d. i. tricho-bothrium distance	1.9	1.4	1.9	1.9	1.8	2.1	1.4
Pectines, teeth (left/right)	19/19	12/12	25/25	19/19	15/15	17/18	17/17

TABLE 1. CONTINUED.

	Vaejovis haradoni	*Vaejovis hearnei*	*Vaejovis janssi*	*Vaejovis littoralis*	*Vaejovis pacificus*	*Vaejovis peninsularis*
Sex — Total Length	♂–17.0	♀–26.0	♂–51.6	♀–30.0	♀–38.5	♂–46.0
Carapace, length/width (at med. eyes)	2.4/1.8	3.4/2.5	10.8/8.3	3.6/3.0	4.6/3.3	5.8/4.2
Diad (w/frontal margin distance)	0.3/0.8	2.5/1.2	1.4/2.1	0.5/2.0	0.5/1.7	1.0/2.1
Metasoma, length	7.6	10.3	46.8	11.1	21.0	20.8
Segment I (length/width)	1.0/1.4	1.4/2.0	6.7/6.4	1.6/2.2	2.1/2.5	2.9/3.7
Segment II (length/width)	1.1/1.3	1.6/1.9	7.5/6.5	1.8/2.0	2.4/2.5	3.3/3.6
Segment III (length/width)	1.3/1.3	1.7/1.8	8.0/6.4	1.9/2.0	2.4/2.5	3.5/3.6
Segment IV (length/width)	1.8/1.2	2.4/1.8	10.4/6.1	2.4/2.0	3.3/2.6	4.6/3.5
Segment V (length/width)	2.4/1.2	3.2/1.8	14.2/5.9	3.4/1.9	4.6/2.6	6.5/3.4
Telson, length	2.3	3.2	12.6	3.4	4.9	6.4
Vesicle (length/width/depth)	1.5/0.8/0.6	1.9/1.3/0.9	8.0/4.6/3.5	2.0/1.6/1.2	3.3/2.3/1.7	4.1/2.6/2.1
Aculeus, length	0.8	1.3	4.6	1.4	1.7	2.3
Pedipalp						
Humerus (length/width)	1.9/0.6	2.9/0.8	11.4/3.1	3.0/1.0	4.4/1.3	5.6/1.6
Brachium (length/width)	2.2/0.7	3.2/1.0	11.0/3.5	3.2/1.2	4.7/1.4	5.7/1.8
Chela, length	3.3	5.0	19.6	5.6	8.0	9.5
Palm (length/width/depth)	1.7/0.8/0.8	2.2/1.1/1.0	8.6/4.2/5.0	2.0/1.5/1.6	3.8/2.0/2.4	4.3/2.4/2.5
Movable finger (length, base)	2.0/0.4	3.2/0.6	12.1/1.9	3.6/0.8	4.8/0.9	6.3/1.0
Fixed finger, length	1.6	2.8	11.0	3.0	4.0	5.2
Supernumerary denticles (FF/MF)	6/6	6/7	7/6	6/7	6/7	6/7
Fixed finger primary denticles	41	42	93	40	43	75
Fixed finger, d. i. tricho-bothrium distance	1.4	1.7	4.6	2.3	3.1	4.2
Pectines, teeth (left/right)	14/14	17/17	21/21	14/13	15/15	22/21

TABLE 2. COMPARISON OF MEASUREMENTS (MM) AND COUNTS OF ALLOTYPES OF SEVEN NEW SPECIES OF BAJA CALIFORNIA SCORPIONS, GENUS *Paruroctonus* AND *Vaejovis*.

	Paruroctonus surensis	*Vaejovis pattersoni*	*Vaejovis adcocki*	*Vaejovis haradoni*	*Vaejovis hearnei*	*Vaejovis janssi*	*Vaejovis peninsularis*
Sex—Total Length	♀–35.3	♀–22.3	♀–40.0	♀–21.0	♂–18.0	♀–58.2	♀–49.0
Carapace, length/width (at med. eyes)	5.3/3.7	3.3/2.4	5.0/3.8	2.8/2.0	2.4/1.6	13.0/10.0	5.9/4.4
Diad (w/frontal margin distance)	0.9/2.3	0.6/1.3	0.6/1.8	0.4/0.9	0.4/0.9	1.8/2.4	0.9/2.1
Metasoma, length	16.0	8.4	17.7	7.7	10.0	51.2	19.6
Segment I (length/width)	2.2/2.5	1.3/2.1	2.4/3.2	1.0/1.4	1.0/1.3	7.0/7.8	2.6/3.5
Segment II (length/width)	2.6/2.4	1.4/2.1	2.8/3.1	1.2/1.3	1.2/1.3	8.3/7.6	3.0/3.5
Segment III (length/width)	2.8/2.3	1.6/2.1	3.0/3.0	1.2/1.2	1.3/1.2	8.8/7.5	3.2/3.3
Segment IV (length/width)	3.3/2.2	2.1/2.2	3.9/2.8	1.7/1.2	1.8/1.2	11.3/7.2	4.4/3.4
Segment V (length/width)	5.1/2.1	3.0/2.1	5.6/2.7	2.6/1.2	2.4/1.2	15.8/7.0	6.4/3.2
Telson, length	5.2	3.1	5.2	2.4	2.3	14.0	6.3
Vesicle (length/width/depth)	2.9/1.8/1.5	2.0/1.3/0.9	3.4/2.4/2.0	1.4/1.0/0.7	1.4/0.9/0.8	8.7/5.1/4.2	4.0/2.6/2.0
Aculeus, length	2.3	1.1	1.8	1.0	0.9	5.3	2.3
Pedipalp							
Humerus (length/width)	3.5/1.3	2.3/1.0	4.6/1.4	2.3/0.7	1.8/0.6	13.0/3.5	5.8/1.6
Brachium (length/width)	4.0/1.9	2.7/1.1	5.2/1.7	2.5/0.9	2.2/0.7	13.4/4.3	5.8/1.9
Chela, length	6.2	4.4	8.1	4.1	3.4	21.0	10.2
Palm (length/width/depth)	3.6/1.6/1.8	2.3/1.0/1.0	3.7/1.7/2.0	2.0/1.0/0.9	1.5/0.8/0.8	8.8/4.4/5.0	4.6/2.1/2.4
Movable finger (length, base)	3.6/0.8	2.6/0.5	5.3/0.9	2.5/0.4	2.0/0.4	14.9/2.3	6.6/1.1
Fixed finger, length	2.6	2.1	4.4	2.1	1.8	12.2	5.6
Supernumerary denticles (FF/MF)	7/6	7/6	6/7	6/7	6/7	7/5	6/7
Fixed finger primary denticles	5	5	47	38	44	92	80
Fixed finger, d. i. trichobothrium distance	2.1	1.5	2.0	1.4	1.2	5.2	4.6
Pectines, teeth (left/right)	9/9	12/12	23/24	12/13	19/19	19/19	17/17

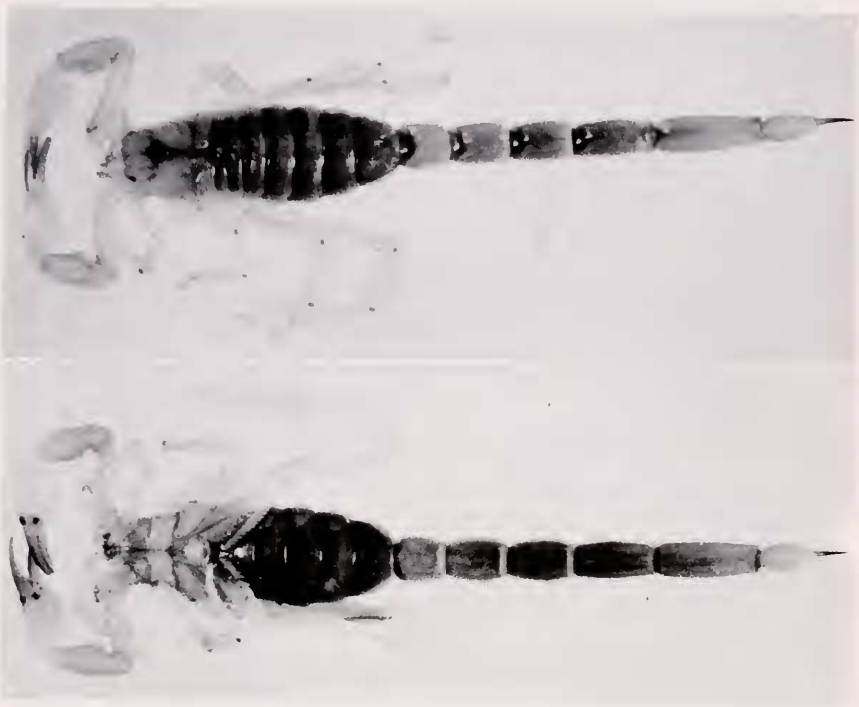

FIGURE 47. *Paruroctonus surensis*, holotype, male, dorsal and ventral views.

Carapace surface moderately granular; anterior margin essentially straight, protrudes slightly medially. Terga lightly granular, mainly posteriorly on each tergum. Ventrolateral metasomal keels I–III crenulate posteriorly, IV crenulate entirely, V serrate; ventromedian keels I–III weakly developed and smooth, IV posteriorly crenulate, V crenulate to serrate; setae short, fine, inconspicuous; ventromedian setae 3, 3, 4, 5 pairs on segments I–IV, respectively. Telson elongate, moderately tubercular on ventral and ventrolateral surfaces; slight subaculear tubercule. Surface of pedipalp chela very finely granular, dorsal and marginal keels moderately developed and lightly granular; fingers weakly scalloped proximally, form very slight space when chela closed; 6 supernumerary granules on fixed fingers and 7 on movable fingers.

DESCRIPTION OF ALLOTYPE.—**Female.** Similar to holotype but differs as follows: carapace, terga, and pedipalps smooth and glossy. Metasomal setae long and conspicuous; ventrolateral keels I–III smooth, ventromedian keels I obsolete to smooth, II–III smooth, IV crenulate posteriorly. Telson surface smooth. Pedipalp-palm keels obsolete to weakly developed, smooth to lightly granular; dentate margins of fingers essentially even, unscalloped.

VARIATION WITHIN PARATYPES.—Similar to holotype and allotype except as follows: ventral counts of metasomal setae in segments I–IV more commonly 3, 4, 4, 5. Pectine teeth 17–19 in males, 8–9 in females.

TYPE DATA.—*Paruroctonus surensis*, holotype (male), allotype and two topoparatypes: CAS Type No. 12249; 12 km SE Guerrero Negro, Baja California Sur, Mexico, 8–VIII–1974, R. M. Haradon, V. F. Lee, W. E. Savary. Paratype (female): same locality, 18–VII–1974.

DISTRIBUTION.—Known only from type-locality in the Vizcaíno Desert.

REMARKS.—Found only on surface of sand-dune communities at night by ultraviolet detection.

Paruroctonus ventosus Williams

(Figures 41, 48)

Paruroctonus ventosus WILLIAMS, 1972:8–9.

DIAGNOSIS.—Adults to about 35 mm long; base color of cuticle yellow, dorsum of carapace

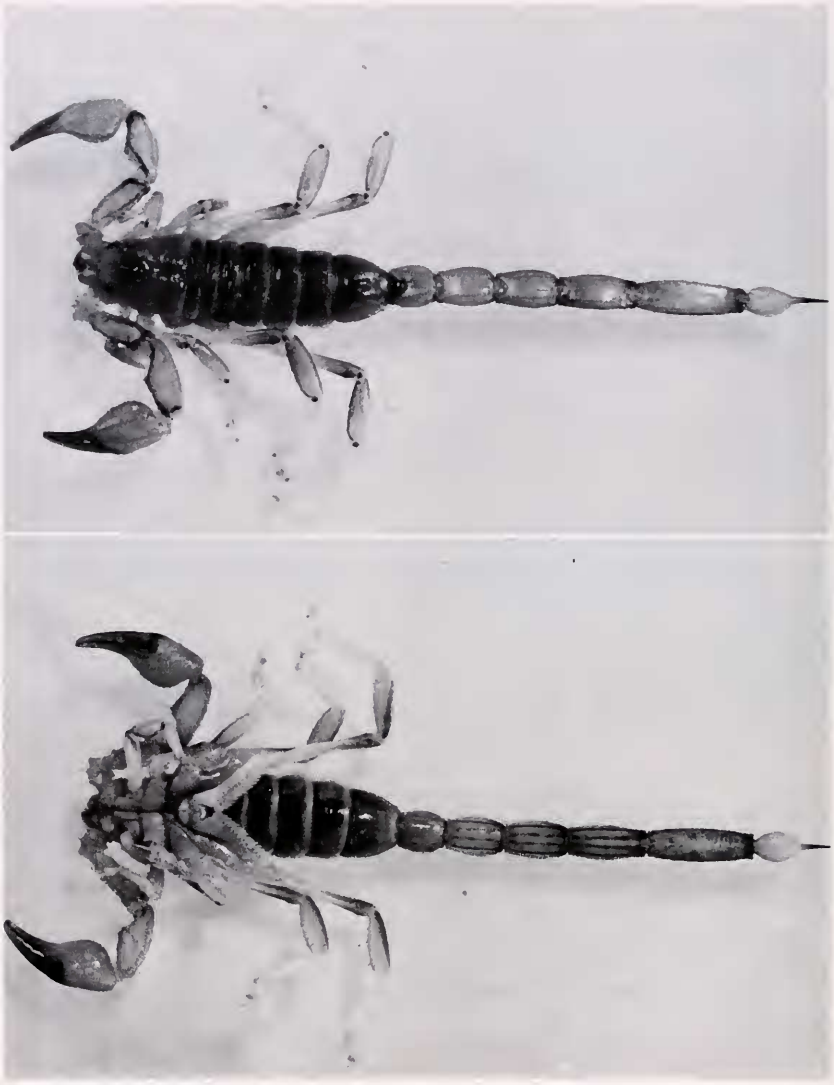

FIGURE 48. *Paruroctonus ventosus*, holotype, male, dorsal and ventral views.

and mesosoma with more or less distinct underlying dusky markings. Metasoma with ventromedian keels obsolete on segment I, smooth to obsolete on segments II–III, smooth to crenulate on segment IV; ventrolateral keels of metasoma smooth to obsolete on segments I–III, smooth to crenulate on IV; pedipalp palms moderately swollen, male with space between proximal ⅔ of fingers when chela closed; pectine teeth 17 in males, 11–13 in females.

Similar to *P. arnaudi* but differs as follows: smaller body size, reddish pedipalp fingers, fewer pectinal teeth.

TYPE DATA.—*Paruroctonus ventosus*, holotype (male), allotype: CAS Type No. 11337; Socorro Sand Dunes, Baja California Norte, Mexico, 12–VII–1969, S. C. Williams, V. F. Lee.

DISTRIBUTION.—Socorro Sand Dunes, northwest coast of Baja California.

Paruroctonus xanthus (Gertsch and Soleglad)

(Figures 36*E*, 37*E*)

Vejovis (Paruroctonus) xanthus GERTSCH AND SOLEGLAD, 1966:34–35.

Paruroctonus xanthus (Gertsch and Soleglad). WILLIAMS 1972:3.

DIAGNOSIS.—Adults to 65 mm long. Entire body pale yellow to golden-orange, lacking contrasting dark color markings. Metasoma with distinct ventrolateral keels on all segments, these weakly denticulate on segment I, nearly smooth with few scattered denticles on II, smooth with more numerous denticles on III, regularly denticulate on IV; metasoma with ventromedian keels of segments I–III distinct but smooth, segment IV with granules along distal fifth of keels; space between ventromedian keels not hirsute; pectine teeth 19–23 in females, 28–32 in males; chelicerae with ventral margin of fixed finger armed with two small denticles near base; ventral margin of movable finger of chelicerae with 6 or 7 irregularly formed denticles; pedipalps with relatively long fingers, fixed finger longer than palm, movable finger longer than carapace or metasomal segment V; pedipalp palm with granular keels.

Similar to *P. mesaensis* and *P. auratus*. Differs from *P. mesaensis* as follows: lack of abundant bristles between ventromedian keels of metasoma; metasomal segment I approximately as long as wide (not longer than wide); fixed finger of pedipalp distinctly longer than palm or metasomal segment V. Differs from *P. auratus* as follows: pedipalp fixed finger longer than carapace or metasomal segment V.

TYPE DATA.—*Vejovis xanthus*, holotype (female): AMNH; 21 km W Winterhaven, Imperial County, California, 13–VI–1958, V. Roth.

DISTRIBUTION.—Sand dunes where borders of Baja California, California, and Arizona intersect. Never reported from Baja California, but probably occurs there.

NEW RECORDS.—**Sonora, Mexico:** 42 km E San Luis, 4–VI–1968 (Cazier, Bigelow, Davidson).

Genus **Syntropis** Kraepelin

(Figure 108*B*)

Syntropis is distinguished from other genera in Baja California as follows: stigma elongate; metasoma with ventromedian keels single and unpaired where developed; males with genital papillae; pedipalp fingers with one continuous row of serrate, primary-row denticles; pedipalp fixed finger with 6 supernumerary granules, fixed finger as long as or longer than carapace; pedipalp brachium with two trichobothria on ventral surface, these along posterior margin.

Syntropis is monotypic and endemic to Baja California and associated islands.

Syntropis macrura Kraepelin

(Figures 49, 50, 108*B*)

Syntropis macrura KRAEPELIN, 1900:16–17. GERTSCH 1958:14–15. STAHNKE 1965:257–263. WILLIAMS 1969:285–291. STAHNKE 1974:120.

DIAGNOSIS.—Adults to about 80 mm long; adults with base color of cuticle rusty brown; pedipalp fingers dark reddish brown; juveniles with base color of cuticle light yellow, pedipalp fingers light yellow; metasoma with ventromedian keels smooth on segments I and II, smooth to crenulate on III, irregularly crenulate on IV and V; metasomal segments each longer than wide; telson with elongate vesicle, short aculeus; pedipalp with long slender fingers, 6 supernumerary granules on fixed finger, 8 supernumerary granules on movable finger; movable pedipalp finger longer than carapace, fixed finger equal to or longer than carapace; pedipalp fingers terminate distally with elongate terminal tooth; chelicera with ventral margin of movable and fixed fingers lacking denticles; pectine teeth 26–32 in males, 24–31 in females.

TYPE DATA.—*Syntropis macrura*, holotype (male): Muséum National d'Histoire Naturelle, Paris; "Lower California, L. Diguet."

DISTRIBUTION.—San Ignacio south to Los Aripes near La Paz, and Isla Carmen.

NEW RECORDS.—**Baja California Sur, Mexico:** San Ignacio, 26–VI–1968 (Williams, Cazier); 56.8 km NW Los Aripes, 27–VII–1968 (Williams, Bentzien, Bigelow); 24.1 km NW Los Aripes, 27–VII–1968 (Williams, Bentzien, Bigelow); Isla Carmen, Puerto Balandra, 23–III–1971 (Lee); 13 km SW San Miguel Comondú, 3–VII–1968 (Williams, Cazier).

REMARKS.—This species is adapted to volcanic habitats where it utilizes the spaces between fractured rocks for shelter. Most specimens found were on more or less vertical cliffs, often high above the ground. In the Comondú area this species has invaded rock walls built by residents in the bottom of the arroyo to keep goats out of farm lands. It does not generally spend much time in exposed situations, even during nocturnal hours.

Juveniles appear much different from adults. They are uniformly pale yellow and lack the contrasting color markings of adults, their metasoma is not as elongate, and their telson is not elongate.

Some geographical variation was evident. The Comondú populations were very much like those taken on Isla Carmen except that the ves-

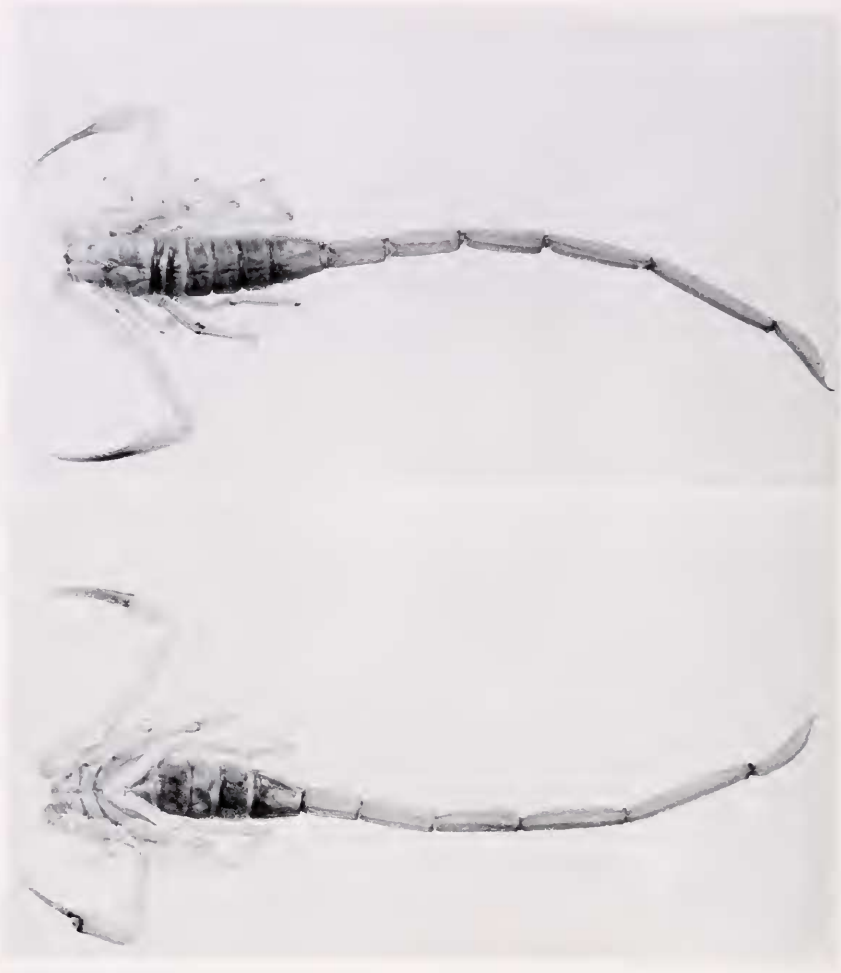

FIGURE 49. *Syntropis macrura*, male, dorsal and ventral views.

icle of the island population was slightly less hirsute. Other than this, the two populations seemed essentially the same and corresponded with the description of the holotype. Adult specimens taken at the southern end of the Sierra Giganta appeared different from the Comondú population as follows: lighter coloration (perhaps reflecting the general lighter coloration of their habitat); adult males had metasomal segment V 5.2 times longer than wide (instead of 7 times longer); adult females had metasomal segment V 4.0 to 4.3 times longer than wide (instead of 5.2 times longer); pectine teeth of males were 26–28 (not 29–32); pectine teeth of females were 24–26 (not 27–31); vesicle was less elongate and more swollen in both sexes.

Genus **Vaejovis** Koch

(Figures 51–57)

Vaejovis is distinguished from other genera in Baja California as follows: sternum of prosoma pentagonal (lateral sides essentially parallel); pedipalp fingers with denticles of primary row arranged in one long continuous row, this row usually more or less subdivided into subrows by slightly enlarged denticles (subrows never arranged obliquely to each other); males with genital papillae; pedipalp brachium with two trichobothria on ventral surface, these along posterior margin; metasoma with ventromedian keels of segments I–IV paired or obsolete; ventral margin of movable cheliceral finger usually completely lacking denticles or crenulations.

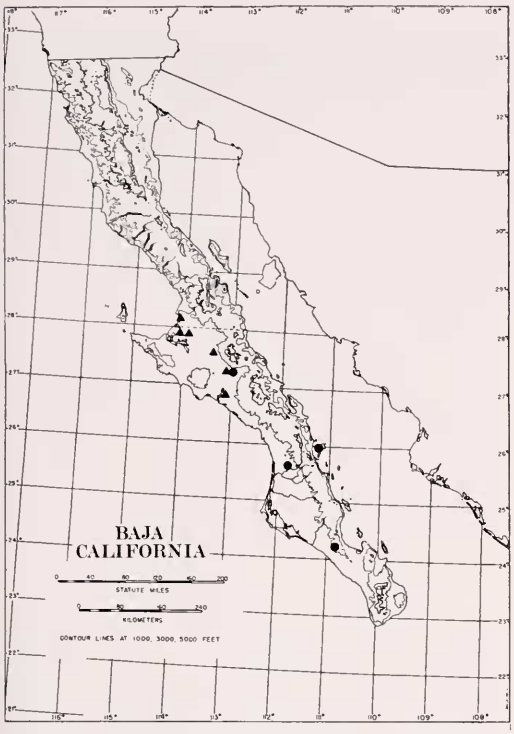

FIGURE 50. Distributions of *Vejovoidus longiunguis* (triangles) and *Syntropis macrura* (circles).

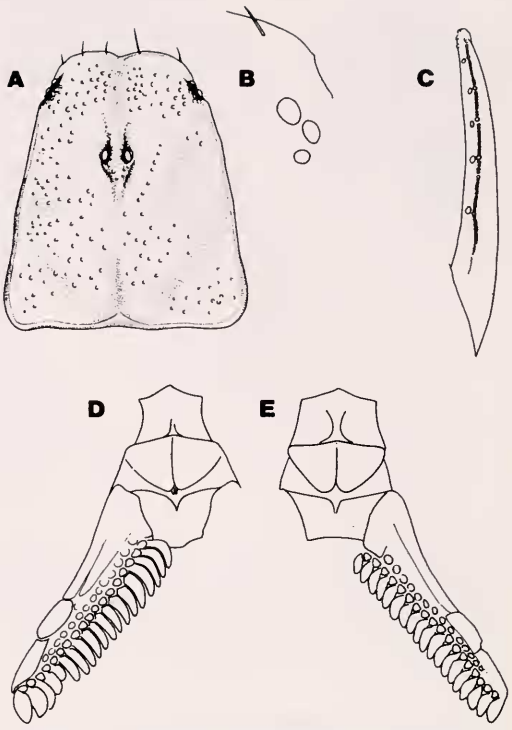

FIGURE 51. Structural characteristics of *Vaejovis* (figured from *V. punctipalpi punctipalpi*). (*A.*) Carapace. (*B.*) Lateral ocelli. (*C.*) Pedipalp movable finger. (*D.*) Male pectine, genital operculum, genital papillae, and prosomal sternum. (*E.*) Female pectine, genital operculum, and prosomal sternum.

This is a diverse genus, with 36 species in Baja California and on associated islands. Four different species subgroups occur: wupatkiensis, eusthenura, punctipalpi (mexicanus group), and minimus. It has been appealing to split this large genus into several genera corresponding to some or all of the above subgroups, but the subgroups have species that link them together making separation at the generic level impossible.

KEY TO THE *VAEJOVIS* FROM BAJA CALIFORNIA AND ADJACENT REGIONS

1. Pedipalp fingers terminating distally in conspicuously elongate, toothlike denticle (Fig. 53*A–K*); fixed pedipalp finger with terminal-denticle length approximating finger depth at first supernumerary granule (terminal-denticle length no less than ¾ depth of finger); fixed pedipalp finger with terminal denticle at least five times longer than first supernumerary granule ---------- 2

Pedipalp fingers not terminating distally in conspicuously elongate, toothlike denticle (Fig. 53*L–Q*); fixed pedipalp finger with terminal-denticle length less than ¾ depth of finger at first supernumerary granule; pedipalp fixed finger with terminal denticle less than five times longer than first supernumerary granule ---------- 16

2(1). Pedipalp fixed finger with 7 or more supernumerary granules flanking primary row of denticles medially (Fig. 54*I*) ---------- *V. harbisoni*

Pedipalp fixed finger with 6 or fewer supernumerary granules flanking primary row of denticles medially (Fig. 54*A–H*) ---------- 3

3(2). Pedipalp fixed finger with primary-row denticles arranged into 6 subrows by enlarged, laterally offset denticles (Fig. 53(*A*, *B*), 54*A*); adults with primary row of denticles on fixed finger composed of 55 or more serrate denticles (juveniles may have slightly fewer denticles) ---------- 4

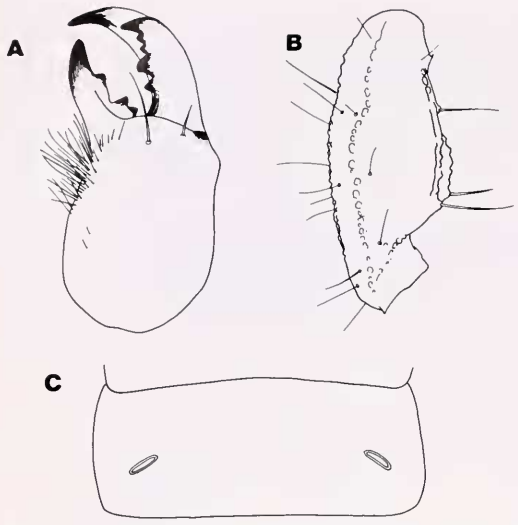

FIGURE 52. Structural characteristics of *Vaejovis* (figured from *V. punctipalpi punctipalpi*). (*A.*) Chelicera, dorsal view (note smooth margin of ventral tyne of movable finger in background). (*B.*) Pedipalp brachium showing number and location of trichobothria. (*C.*) Mesosomal sternum showing stigma.

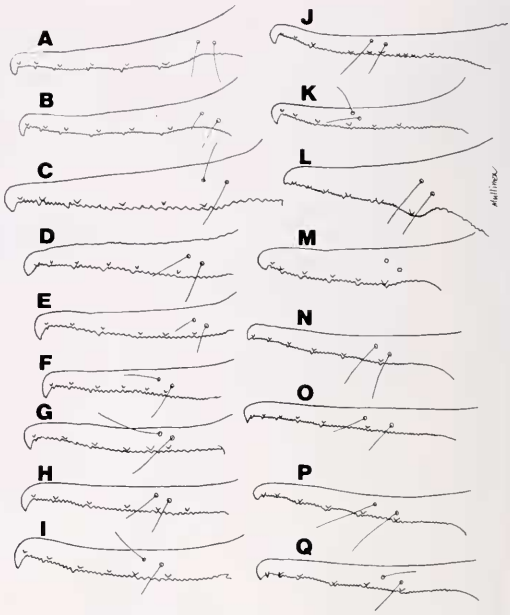

FIGURE 53. Structural characteristics of the pedipalp fixed finger of various species of *Vaejovis*, prolateral view (note location of trichobothria *id* [interior distal] and *ip* [interior proximal] in relation to proximal supernumerary granules). (*A.*) *Vaejovis janssi*, new species, holotype (male). (*B.*) *Vaejovis peninsularis*, new species, holotype (male). (*C.*) *Vaejovis pacificus*, new species, holotype (female). (*D.*) *Vaejovis littoralis*, new species, holotype (female). (*E.*) *Vaejovis baueri*, topotype (female). (*F.*) *Vaejovis minutis*, topoparatype (male). (*G.*) *Vaejovis gigantaensis*, new species, holotype (male). (*H.*) *Vaejovis hearnei*, new species, holotype (female). (*I.*) *Vaejovis gertschi*, topoparatype (male). (*J.*) *Vaejovis harbisoni*, topoparatype (male). (*K.*) *Vaejovis adcocki*, new species, holotype (male). (*L.*) *Vaejovis punctipalpi punctipalpi*, topotype (male). (*M.*) *Vaejovis eusthenura*, topotype (male). (*N.*) *Vaejovis puritanus*, male. (*O.*) *Vaejovis viscainensis*, topoparatype (male). (*P.*) *Vaejovis confusus*, male. (*Q.*) *Vaejovis waeringi*, topoparatype (male).

Pedipalp fixed finger with primary-row denticles not arranged into subrows, or arranged into 5 or fewer subrows by slightly enlarged denticles (Fig. 54*B–I*); adults and juveniles with 54 or fewer denticles in primary row of fixed finger 5

4(3). Metasomal segment II wider than long; metasomal segment V with length less than twice width; ventromedian metasomal keels smooth on segments I and II; central Baja California peninsula ..... *V. peninsularis* Williams, new species

Metasomal segment II with length equal to or longer than width; metasomal segment V with length equal to or more than twice width; ventromedian metasomal keels crenular on segments I and II; Socorro Island ..... *V. janssi* Williams, new species

5(3). Pectines with 21 or more teeth per comb in males, females with 19 or more teeth per comb ..... *V. adcocki* Williams, new species

Pectines with 20 or fewer teeth per comb in males, females with 18 or fewer teeth per comb 6

6(5). Metasomal segment IV wider than segment III; dorsolateral keels of metasomal segment IV flair laterally in winglike fashion (Fig. 94) 7

Metasomal segment IV as wide as or narrower than segment III; dorsolateral keels do not flair laterally in winglike fashion (Fig. 96) 8

7(6). Metasomal segment IV as wide as or wider than long; Isla San Benitos ..... *V. baueri*

Metasomal segment IV longer than wide; Isla Cedros and adjacent peninsula ..... *V. pacificus* Williams, new species

8(6). Ventromedian metasomal keels obsolete or smooth on segments I and II 9

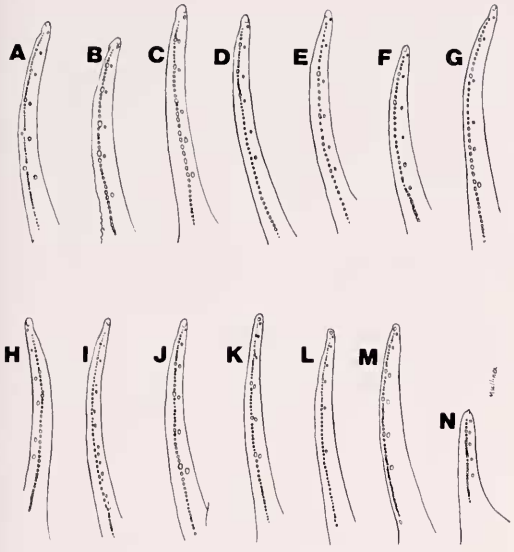

FIGURE 54. Structural characteristics of the pedipalp fixed finger of various species of *Vaejovis* and *Paravaejovis*. (*A.*) *Vaejovis peninsularis*, new species, holotype (male). (*B.*) *Vaejovis littoralis*, new species, holotype (female). (*C.*) *Vaejovis pacificus*, new species, holotype (female). (*D.*) *Vaejovis bechteli*, new species, holotype (female). (*E.*) *Vaejovis gigantaensis*, new species, holotype (male). (*F.*) *Vaejovis minutis*, topoparatype (male). (*G.*) *Vaejovis gertschi*, topoparatype (male). (*H.*) *Vaejovis armadentis*, new species, holotype (male). (*I.*) *Vaejovis harbisoni*, topoparatype (male). (*J.*) *Vaejovis confusus*, male. (*K.*) *Vaejovis waeringi*, topoparatype (male). (*L.*) *Vaejovis viscainensis*, topoparatype (male). (*M.*) *Vaejovis puritanus*, male. (*N.*) *Paravaejovis pumilis*, male.

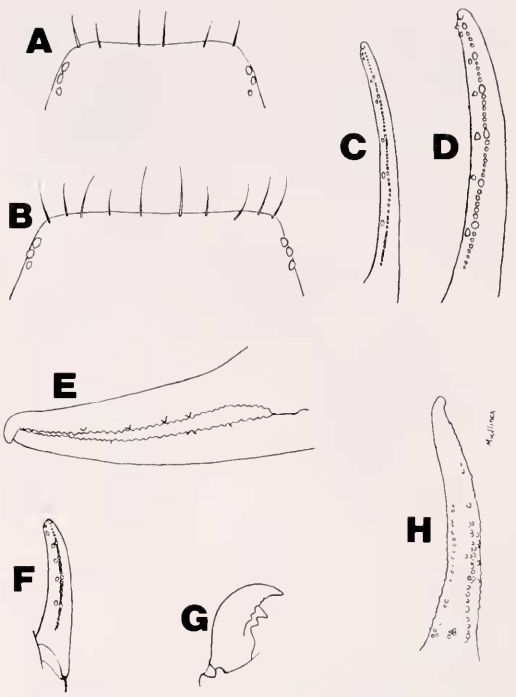

FIGURE 55. Structural characteristics of species of *Vaejovis*. (*A.*) Carapace of *V. diazi* (note frontal margin set with three pairs of setae). (*B.*) Carapace of *V. eusthenura* (note frontal margin set with five pairs of setae). (*C.*) Pedipalp movable finger of *V. waeringi* (note primary denticles subdivided into five subrows). (*D.*) Pedipalp movable finger of *V. spinigerus* (note primary denticles subdivided into six subrows). (*E.*) Pedipalp chela of *V. armadentis*, new species, holotype (male), showing elongate gap between fingers when chela closed. (*F.*) Pedipalp movable finger of *V. andreas* (note 6 supernumerary granules). (*G.*) Cheliceral movable finger of *V. montcazieri* (note denticles on ventral tyne). (*H.*) Pedipalp fixed finger, dorsal view, of *V. littoralis* (note coarse granulation).

Ventromedian metasomal keels crenular on segments I and II 13

9(8). Pedipalp chela more swollen, ratio of carapace width to palm width less than 2.0 ..... *V. dwyeri* Williams, new species

Pedipalp chela more slender, ratio of carapace width to palm width 2.0 or greater 10

10(9). Metasomal segment V with ventromedian and ventrolateral keels obsolete ..... *V. gigantaensis* Williams, new species

Metasomal segment V with ventromedian and ventrolateral keels developed 11

11(10). Telson with swollen vesicle, vesicle as wide as or wider than metasomal segment V; pedipalp palm with inner marginal keel obsolete; pedipalp palm with length-to-width ratio 2.0 or greater ..... *V. bechteli* Williams, new species

Telson with vesicle narrower than metasomal segment V; pedipalp palm with inner marginal keel developed and set with several granules; pedipalp palm with length-to-width ratio less than 2.0 12

12(11). Metasomal ventrolateral keels distinctly developed and uniformly crenular on segments I–IV (Fig. 103); pedipalp fixed finger with trichobothrium *ip* proximal to supernumerary granule 6 (Fig. 53*H*). ..... *V. hearnei* Williams, new species

Metasomal ventrolateral keels irregularly developed and smooth to irregularly

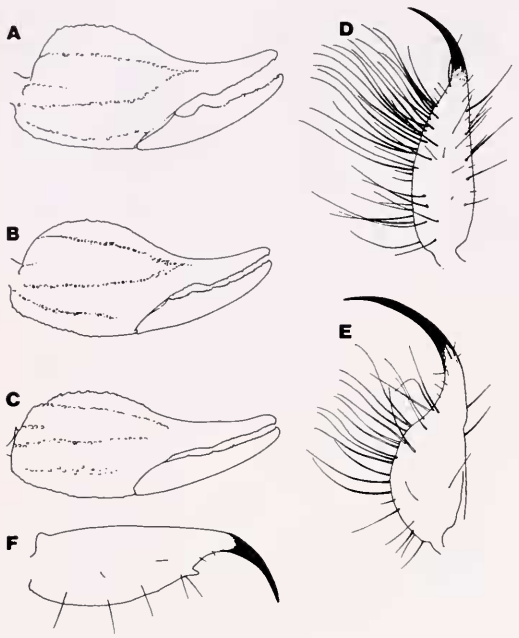

FIGURE 56. Structural characteristics of species of *Vaejovis*. (*A.*) Pedipalp chela, retrolateral view of *V. punctipalpi punctipalpi*, male, showing deep internal scalloping of fingers. (*B.*) Pedipalp chela, retrolateral view of *V. magdalensis*, male, showing slight internal scalloping of fingers. (*C.*) Pedipalp chela, retrolateral view of *V. bruneus bruneus*, male, showing lack of proximal pedipalp scallop between fingers. (*D.*) Telson of *V. hirsuticauda*, male, showing elongate vesicle, short aculeus, and long setae on ventral surface of vesicle. (*E.*) Telson of *V. insularis*, male, showing elongate strongly curved aculeus and long setae on vesicle. (*F.*) Telson of *V. pattersoni*, showing subaculear tooth.

crenulate on segments I–IV (Fig. 105); pedipalp fixed finger with trichobothrium *ip* distal to supernumerary granule 6 (Fig. 53*F*) ..... *V. minutis*

13(8). Pedipalp palm more swollen, ratio of movable-finger length to palm width 2.0 or less, ratio of movable–finger length to palm length less than 1.0; pedipalp fixed finger slightly scalloped basally, forming long gap between fingers with chela closed (Fig. 55*E*) ..... *V. armadentis* Williams, new species

Pedipalp palm less swollen, ratio of movable-finger length to palm width greater than 2.0, ratio of movable-finger length to palm length greater than 1.0; pedipalp fixed finger not scalloped, fingers do not form long distinct gap when chela closed 14

14(13). Pedipalp with ratio of movable-finger length to palm width 2.75 or more; pedipalp with ratio of chela length to palm width 4.3 or greater ..... *V. gertschi*

Pedipalp with ratio of movable-finger length to palm width less than 2.75; pedipalp with ratio of chela length to palm width less than 4.3 15

15(14). Pedipalp fixed finger conspicuously granular from above (Fig. 55*H*); pedipalp with ratio of fixed-finger length to palm length 1.2 or greater; pedipalp with ratio of movable-finger length to palm width 2.3 or less ..... *V. littoralis* Williams, new species

Pedipalp fixed finger not granular, but smooth; pedipalp with ratio of fixed-finger length to palm length less than 1.1; pedipalp with ratio of movable-finger length to palm width greater than 2.3 ..... *V. haradoni* Williams, new species

16(1). Pedipalp palm greatly swollen, ratio of movable-finger length to palm width 1.8 or less 17

Pedipalp palm not greatly swollen, ratio of movable-finger length to palm width greater than 1.8 30

17(16). Pectine teeth 15 or fewer in males, 14 or fewer in females; ratio of metasoma length to width of metasomal segment V equal to or less than 7.5; metasomal segment II as wide as or wider than long; metasomal segment IV with ratio of length to width 1.5 or less 18

Pectine teeth 16 or more in males, 15 or more in females; ratio of metasoma length to width of metasomal segment V greater than 7.5; metasomal segment II longer than wide; metasomal segment IV ratio of length to width greater than 1.5 22

18(17). Chelicera with ventral margin of movable finger armed with about 5 tiny crenulations (Fig. 55*G*); chelicera with ventral margin of fixed finger armed with about 3 tiny denticles in region opposite large bicuspid tooth of dorsal margin ..... *V. montcazieri*

Chelicera with ventral margin of movable

finger completely lacking denticles (Fig. 52*A*); chelicera with ventral margin of fixed finger completely lacking denticles 19

19(18). Metasomal segment III wider than long ..... *V. minimus castaneous*
Metasomal segment III as long as or longer than wide 20

20(19). Pedipalp movable finger with 6 supernumerary granules flanking primary-row denticle medially (Fig. 55*F*) ..... *V. andreas*
Pedipalp movable finger with 7 supernumerary granules flanking primary-row denticles medially 21

21(20). Pedipalp with ventral keel of palm developed, angular and granular (Fig. 81); pedipalp fixed finger with trichobothrium *ip* directly over movable-finger articulation; pectine teeth 11 in males, 9 in females; northwestern region of peninsula ..... *V. rufulus*
Pedipalp with ventral keel of palm rounded to obsolete (Fig. 79); pedipalp fixed finger trichobothrium *ip* slightly distal to movable-finger articulation; pectine teeth 14 in males, 12 in females; Cape region ..... *V. lindsayi*

22(17). Pedipalps with more or less distinct scalloping of inner-finger margins (Fig. 56*A*, *B*) 23
Pedipalps without scalloping of inner-finger margins apparent (Fig. 56*C*) 26

23(22). Pedipalps with subtle scalloping of inner-finger surfaces (Fig. 56*B*); no distinct open space remaining between fingers in proximal pedipalp scallop with chela closed; aculeus distinctly shorter than vesicle; Magdalena Plain region ..... *V. magdalensis*
Pedipalp with conspicuous scalloping of inner-finger surfaces (Fig. 56*A*); distinct open space remaining between fingers in proximal scallop with chela closed; aculeus as long as or longer than vesicle (similar to Fig. 57*A–C*; Cape region and associated islands ..... (*V. punctipalpi*) 24

24(23). Vesicle of female not conspicuously hirsute (Fig. 57*B*); La Paz south to Cabo San Lucas ..... *V. punctipalpi punctipalpi*

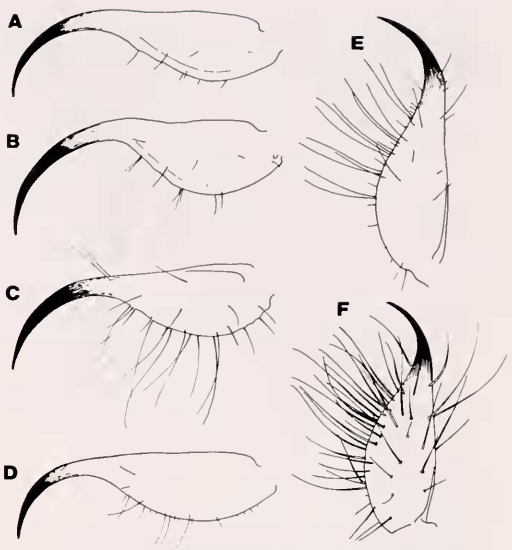

FIGURE 57. Structural characteristics of species of *Vaejovis*. (*A.*) Telson of *V. punctipalpi punctipalpi*, male. (*B.*) Telson of *V. punctipalpi punctipalpi*, female (note female aculeus is more elongate and more curved than that of male). (*C.*) Telson of *V. punctipalpi barbatus*, female (note hirsuteness of vesicle). (*D.*) Telson of *V. bruneus bruneus*, male. (*E.*) Telson of *V. bruneus loretoensis*, male (note long setae restricted to a ventral patch on vesicle). (*F.*) Telson of *V. bruneus villosus*, male (note long setae ventrally and extending to lateral regions of vesicle).

Vesicle of female conspicuously hirsute (Fig. 57*C*) 25

25(24). Vesicle of both male and female conspicuously hirsute; Isla Cerralvo ..... *V. punctipalpi cerralvensis*
Vesicle of male not conspicuously hirsute (female vesicle hirsute); southern end of Magdalena Plain south to San Bartolo and on Islas Espíritu Santo and Partida ..... *V. punctipalpi barbatus*

26(22). Metasomal segment I longer than wide; metasomal segment V more than 3 times longer than wide ..... *V. hirsuticauda*
Metasomal segment I as wide as or wider than long; metasomal segment V less than 3 times longer than wide 27

27(26). Body pale yellow; males with more elongate aculeus, ratio of vesicle to aculeus length less than 1.5 in males (Fig. 56*E*); pedipalp chela more slender, ratio of movable-finger length to palm width 1.6 or greater in males, 1.8 or greater in

females; Islas Espíritu Santo and Partida ..... *V. insularis*

Body rusty or brown; males with less elongate aculeus, ratio of vesicle to aculeus length 1.5 or more in males (Fig. 57*D–F*); pedipalp chela slightly less slender, ratio of movable-finger length to palm width less than 1.6 in males, less than 1.8 in females ..... (*V. bruneus*) 28

28(27). Vesicle of telson without abundant, long hairs on ventral surface (Fig. 57*D*); Comondú and San Raymundo region ..... *V. bruneus bruneus*

Vesicle of telson with abundant long hairs on ventral surface (Fig. 57*E*, *F*) 29

29(28). Ratio of vesicle length to aculeus length 1.8 or greater in males, 1.5 or greater in females; vesicle of telson with small patch of long hairs on ventral surface (Fig. 57*E*); pedipalp fingers more reddish than brown; central region of peninsula from around El Arco to Loreto and Isla Coronados ..... *V. bruneus loretoensis*

Ratio of vesicle length to aculeus length less than 1.8 in males, less than 1.5 in females; vesicle of telson densely covered with long conspicuous hairs over most of ventral surface (not limited to small ventral patch)(Fig. 57*F*); pedipalp fingers dark brown; Misión San Borja south to Puerto Escondido and on adjacent islands ..... *V. bruneus villosus*

30(16). Pedipalp fixed finger with primary-row denticles subdivided into five subrows of denticles by 4 slightly enlarged denticles (Fig. 54*L*, *M*); pedipalp fixed finger with supernumerary granule 6 (proximal one) not closely paired with an adjacent enlarged denticle in primary row (Fig. 54*L*, *M*) 31

Pedipalp fixed finger with primary row of denticles subdivided into 6 subrows of denticles by 5 slightly enlarged denticles (Fig. 54*J*, *K*); pedipalp fixed finger with supernumerary granule 6 (proximal one) closely paired with an adjacent enlarged denticle in primary row (Fig. 54*J*, *K*) 32

31(30). Metasomal keels more finely crenulate, dorsal keels of segment III with 25 or more crenulations; pedipalp palm more slender and fingers more elongate, ratio of movable-finger length to palm width 3.7 or greater; pedipalp palm narrower than brachium width ..... *V. viscainensis*

Metasomal keels more coarsely crenulate, dorsal keels of segment III with fewer than 25 crenulations; pedipalp with palm less slender and fingers less elongate, ratio of movable-finger length to palm width less than 3.7; pedipalp palm equal to or wider than brachium in width ..... *V. puritanus*

32(30). Pedipalp movable finger with primary row of denticles subdivided into 6 subrows by 5 slightly enlarged denticles (Fig. 55*C*); pedipalp movable finger with most proximal supernumerary granule not paired with an adjacent enlarged denticle in primary row (Fig. 55*C*) 33

Pedipalp movable finger with primary row of denticles subdivided into 7 subrows by 6 slightly enlarged denticles (Fig. 55*D*); pedipalp movable finger with most proximal supernumerary granule closely paired with an adjacent enlarged denticle in primary row (Fig. 55*D*) 39

33(32). Mesosomal dorsum with 4 dark longitudinal stripes; pedipalp fingers contrastingly reddish brown compared to yellow palm; pedipalps and much of dorsal aspect of body covered with conspicuous dark blotches (Fig. 74) 34

Mesosomal dorsum lacking 4 dark longitudinal stripes, dorsum either pale yellow or with faint, general underlying dusky markings; pedipalp finger similar to palm in color; body not covered with conspicuous dark blotches 35

34(33). Pectine teeth 11–15 on males, 11–12 on females; pedipalp fingers with enlarged primary-row denticles 4 and 5 slightly offset toward retrolateral side; with distinct, pointed subaculear tooth (Fig. 56*F*) ..... *V. pattersoni*, new species

Pectine teeth 18–22 in males, 15–18 in females; pedipalp finger with enlarged primary-row denticles never offset to retrolateral side, but in direct line with smaller primary-row denticles; telson with small rounded subaculear tubercule (not distinctly pointed) ..... *V. vittatus*

35(33). Metasoma with region of ventromedian and ventrolateral keels of segments I–IV usually outlined with dark longitudinal stripes (Fig. 65); metasomal segment IV depth distinctly greater than depth of segment I; pectine teeth 19 or more in females, 23 or more in males ..... *V. gravicaudus*

Metasoma with region of ventromedian and ventrolateral keels of segments I–IV not outlined with dark longitudinal stripes; metasomal segment IV depth approximating depth of segment I; pectine teeth 18 or fewer in females, 22 or fewer in males 36

36(35). Metasoma with ventromedian keels of segment IV obsolete; metasoma with ventrolateral keels of segment III obsolete or smooth; pedipalp fixed finger with 14 or fewer denticles in proximal subrow of primary-row denticles ..... (*V. hoffmanni*) 37

Metasoma with ventromedian keels of segment IV not obsolete, but crenulate; metasoma with ventrolateral keels of segment III distinctly crenulate; pedipalp fixed finger with 15 or more denticles in proximal subrow of primary row 38

37(36). Carapace and terga with conspicuous underlying dusky markings ..... *V. hoffmanni fuscus*

Carapace and terga lacking dusky markings ..... *V. hoffmanni hoffmanni*

38(36). Ventromedian keels of metasomal segment III smooth to crenulate; movable finger of pedipalp equal to or longer than carapace length ..... *V. waeringi*

Ventromedian keels of metasoma finely crenulate on segment III; movable finger of pedipalp slightly shorter than carapace length ..... *V. confusus*

39(32). Metasoma with region of ventromedian and ventrolateral keels of segments I–IV outlined by dark longitudinal stripes (Fig. 72); metasomal segment IV with depth greater than depth of segment I; pectines with 16 or more teeth per comb in females, 22 or more teeth per comb in males ..... *V. spinigerus*

Metasoma with region of ventromedian and ventrolateral keels of segments I–IV without dark longitudinal stripes; depth of metasomal segment IV not greater than depth of segment I; pectines with 16 or fewer teeth per comb in females, 21 or fewer teeth per comb in males 40

40(39). Metasoma with ventrolateral keels of segment IV smooth to crenulate, each keel with approximately 19 low crenulations ..... *V. galbus*

Metasoma with ventrolateral keels of segment IV smooth; crenulations, if present, faintly developed, irregular in form, and fewer than 10 41

41(40). Frontal margin of carapace with 4 or more pairs of conspicuous erect hairs (Fig. 55*B*); Cape region of peninsula ..... *V. eusthenura*

Frontal margin of carapace with 3 pairs of conspicuous erect hairs (Fig. 55*A*); San Ignacio region to La Paz ..... (*V. diazi*) 42

42(41). Telson vesicle reddish in contrast with yellow metasoma; west side of Sierra Giganta ..... *V. diazi diazi*

Telson vesicle same yellow color as metasoma; east side of Sierra Giganta ..... *V. diazi transmontanus*

Genus **Vaejovis:** eusthenura subgroup

Members of the eusthenura subgroup are distinguished from others as follows: metasomal segment V distinctly longer than either carapace or movable finger; pedipalp fingers elongate, movable and fixed finger each distinctly longer than underhand; pedipalp palm narrow, with keels low to obsolete; dorsal and dorsolateral keels of metasoma well developed and coarsely crenulate to serrate; ventrolateral keels of metasoma present, these smooth, crenulate or intermediate; ratio of chela length to palm width 3.3 to 6.2; ratio of fixed-finger length to length of palm 0.7 to 1.4; ratio of movable-finger length to palm width 2.0 to 4.4; pedipalp with 6 supernumerary granules on fixed, 7 on movable finger.

The following 12 Baja California species are members of the eusthenura subgroup: *V. confusus*, *V. waeringi*, *V. galbus*, *V. diazi*, *V. eusthenura*, *V. hoffmanni*, *V. gravicaudus*, *V. spinigerus*, *V. puritanus*, *V. vittatus*, *V. viscainensis*, and *V. pattersoni*.

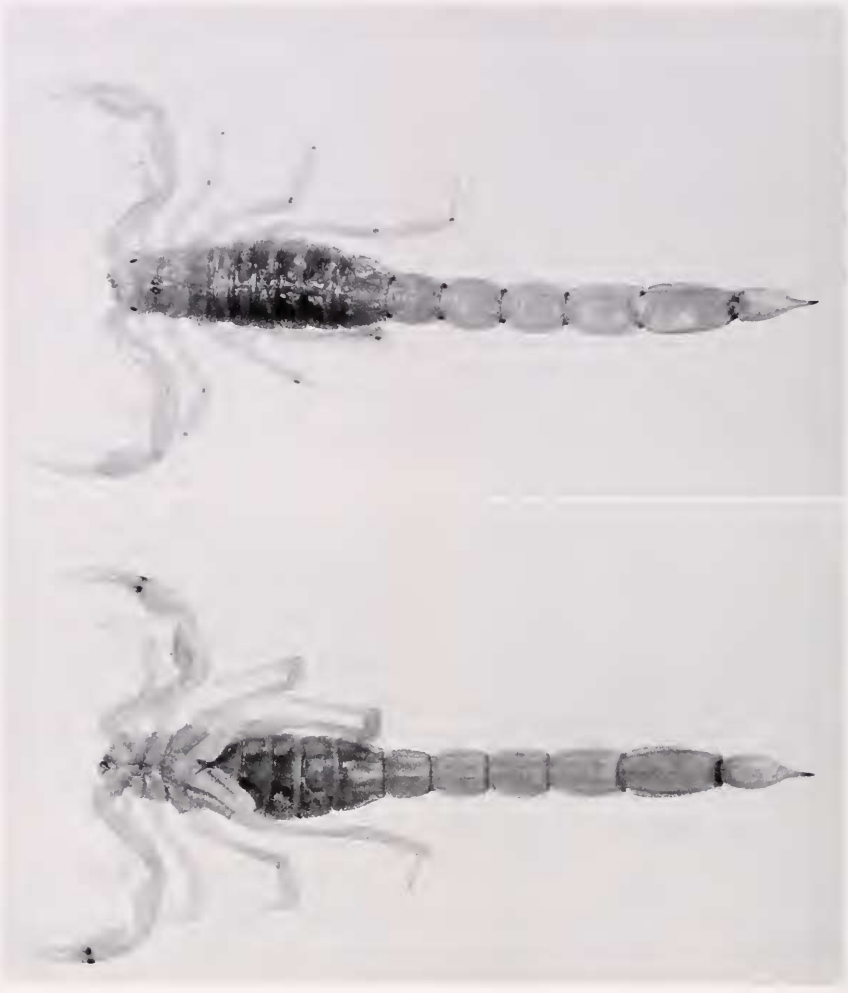

FIGURE 58. *Vaejovis confusus*, male, dorsal and ventral views.

Vaejovis confusus Stahnke

(Figures 53*P*, 54*I*, 58, 59)

Vejovis confusus STAHNKE, 1940:101. GERTSCH AND ALLRED 1965:4. WILLIAMS AND HADLEY 1967:112. STAHNKE 1974:135.

Vejovis flavus Banks [part]. STAHNKE 1956:27.

Vaejovis confusus Stahnke. JOHNSON AND ALLRED 1972:166–168.

DIAGNOSIS.—Adults to 55 mm long; base color of body pale yellow, pedipalp fingers slightly more reddish than palm, no distinctive color pattern dorsally. Metasoma with ventrolateral keels crenulate to serrate on segments I–V; ventromedian keels basically smooth on segment I, smooth to faintly crenulate on segments II and III, crenulate on segment IV; segment I as wide or wider than long, segment II as long as wide or slightly longer, segment III longer than wide, segment V 1.9–2.1 times longer than wide. Pedipalp with elongate fingers, slender palm, ratio of movable-finger length to carapace length 0.9–1.0; ratio of chela length to palm width 3.9–4.2; ratio of movable-finger length to palm width 2.5–2.8; palm keeled with rounded, sometimes indistinct, granules; supernumerary granules 6 on fixed finger, 7 on movable finger; pectine teeth 14–19 in males, 10–14 in females; telson with ventral surface of vesicle with many broad, rounded granules.

Similar to *Vaejovis waeringi* but differs as follows: metasoma with ventromedian keels finely

crenulate on segment III (not smooth to crenulate); ratio of fixed-finger length to palm length 1.1 or less; ratio of chela length to palm width less than 5.0 in males, less than 4.3 in females; ratio of palm width to brachium width less than 1.0; movable finger of pedipalp slightly shorter than carapace.

TYPE DATA.—*Vejovis confusus*, syntypes: H. L. Stahnke collection; Arizona: Coolidge, Mesa, Superior, Tucson, Wickenburg, and Casa Grande National Monument.

DISTRIBUTION.—Baja California, near Algodones; Sonora; California; Arizona; Nevada.

NEW RECORDS.—**Baja California Norte, Mexico:** Algodones, 18–VII–1969 (Williams, Lee).

Vaejovis eusthenura (Wood)

(Figures 54*M*, 55*B*, 59, 60)

Buthus eusthenura WOOD, 1863a:109. WOOD 1863b:368. *Vejovis eusthenura* (Wood). GERTSCH 1958:13–14.

DIAGNOSIS.—Adults to 55 mm long. Base color of body pale yellow, pedipalp fingers similar to palm in color, no contrasting pattern. Metasoma with ventrolateral keels smooth on segments I–IV, ventromedian keels smooth to obsolete on segments I–IV, segment I distinctly wider than long, segment II as long as wide or longer, segment III longer than wide, segment V 1.9–2.1 times longer than wide. Pedipalp with moderately long fingers, palm moderately slender, ratio of movable-finger length to carapace length 0.7–0.8, ratio of chela length to palm width 3.6–4.6, ratio of movable-finger length to palm width 2.2–2.7, supernumerary granules 6 on fixed finger, 7 on movable finger, primary-row denticles subdivided into 6 subrows by 5 slightly enlarged denticles on fixed finger, subdivided into 7 subrows by 6 slightly enlarged denticles on movable finger, mature males with large open scallop between fingers when chela closed. Pectine teeth 18–21 in males, 16–17 in females; carapace with frontal margin set with 4 or more pairs of conspicuous erect hairs.

Similar to *Vaejovis diazi* but differs as follows: carapace with frontal margin set with 4 or more pairs long setae (not 3 pairs setae).

TYPE DATA.—*Buthus eusthenura*, syntypes: "Hab.—Cape St. Lucas. J. Xantus de Vesey. Smithsonian Museum." Syntypes lost.

DISTRIBUTION.—Cabo San Lucas north to San Antonio.

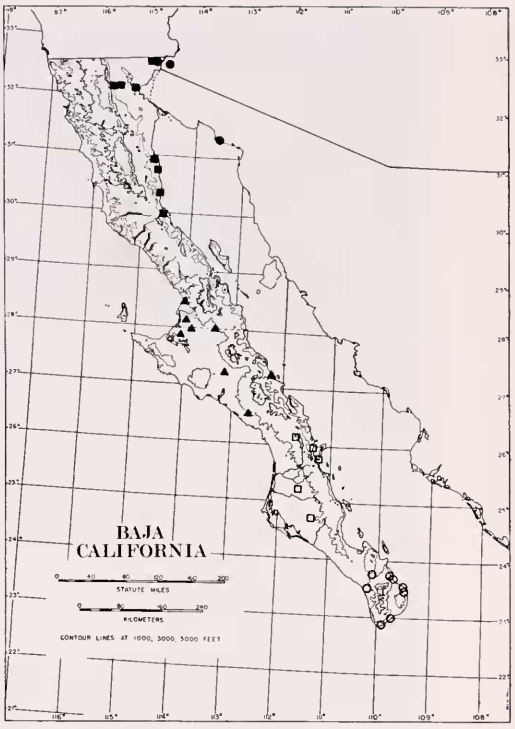

FIGURE 59. Distribution of *Vaejovis confusus* (closed circles), *Vaejovis eusthenura* (open circles), *Vaejovis galbus* (open squares), *Vaejovis viscainensis* (triangles), and *Vaejovis waeringi* (closed squares).

NEW RECORDS.—**Baja California Sur, Mexico:** 10.9 km SE San Antonio, 24–VII–1968 (Williams, Bentzien); 0.8 km E San Bartolo, 24–VII–1968 (Williams, Bentzien); 0.5 km S Rancho Buena Vista, 6–V–1969 (Williams); Punta Pulmo, 2–VII–1973 (Williams, Blair); La Ribera, 10–II–1966 (Roth, AMNH); 27 km N Todos Santos, Hondo Arroyo, 4–II–1966 (Roth, AMNH); 18 km W Punta Palmilla, 9–V–1969 (Williams); Cabo San Lucas, 19–VII–1968 (Williams, Cazier).

REMARKS.—In the original description, the type-locality was stated to be Cape San Lucas with Xantus de Vesey as collector. Numerous scorpions were subsequently taken in the Cabo San Lucas region to resolve the identity of *V. eusthenura*. Seven species of scorpions were found in the Cabo San Lucas region. Of these, three were in the genus *Vaejovis*, and only one of these agreed with Wood's original description of *V. eusthenura*. The above diagnosis is based on presumed topotypes from Cabo San Lucas since there is little doubt that these represent the same population described by Wood as *V. eusthenura*.

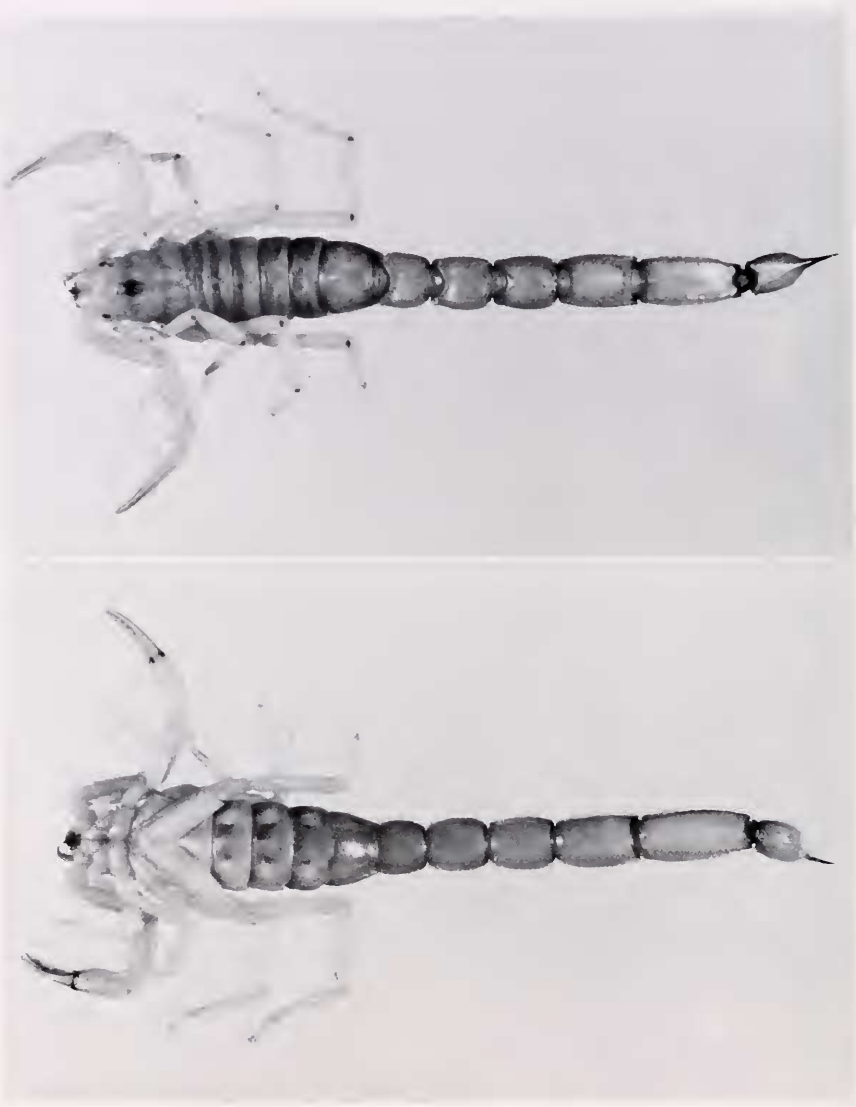

FIGURE 60. *Vaejovis eusthenura*, topoparatype, male, dorsal and ventral views.

Vaejovis diazi Williams

Vejovis diazi WILLIAMS, 1970:307–313, STAHNKE 1974:135.

DIAGNOSIS.—Adults to about 43 mm long; base color of body pale yellow, carapace and mesosomal dorsum with or without underlying dusky markings, mature males and females with reddish telson and pedipalp fingers. Pedipalp palms moderately swollen; palm keels obsolete; ratio of movable-finger length to carapace length 0.7–0.9; ratio of chela length to palm width 3.3–3.9; mature males with small open scallop remaining between fingers when chela closed; supernumerary granules 6 on fixed finger, 7 on movable finger; movable finger with primary-row denticles subdivided into 7 subrows by 6 slightly enlarged denticles; movable finger with most proximal supernumerary granule closely paired with adjacent enlarged denticle in primary row; fixed finger with primary-row denticles separated into 6 subrows of denticles by 5 slightly enlarged denticles; fixed finger with proximal supernumerary granule closely paired

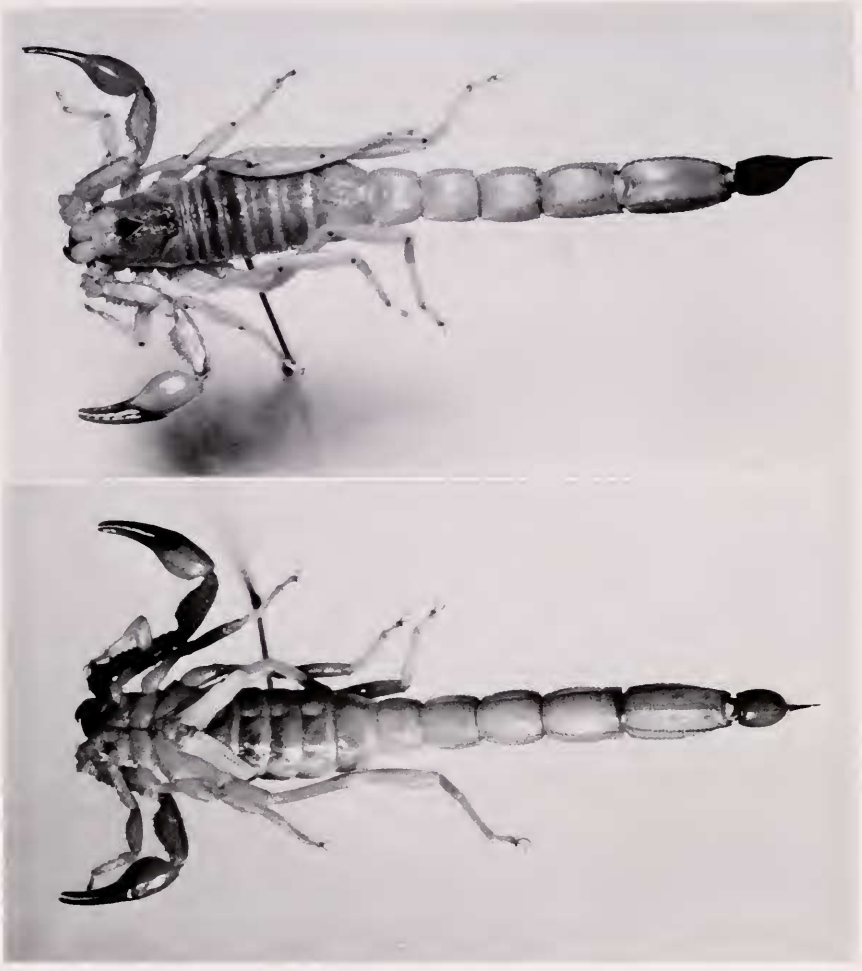

FIGURE 61. *Vaejovis diazi diazi*, topoparatype, male, dorsal and ventral views.

with an adjacent enlarged denticle in primary row; pedipalp fingers not terminating distally with conspicuously elongate, toothlike denticle. Pectine teeth 13–16 in females, 17–20 in males.

Similar to *Vaejovis eusthenura* but differs as follows: reddish pedipalp fingers; reddish telson; 3 pairs setae on frontal margin of carapace (not 5 pairs such setae); larger pedipalp scallop in males.

Vaejovis diazi is polytypic with two endemic subspecies: *V. diazi diazi* and *V. d. transmontanus*.

Vaejovis diazi diazi Williams

(Figures 55A, 61, 62)

Vejovis diazi WILLIAMS, 1970:307–313.

DIAGNOSIS.—Essentially identical in structure, size, and coloration to *Vaejovis diazi transmontanus* but differs as follows: reddish telson which contrasts with yellow metasomal segments.

TYPE DATA.—*Vejovis diazi*, holotype (male), allotype: CAS, Type No. 10413; 34.4 km W El Crucero, 26–VII–1968, S. C. Williams, M. A. Cazier.

DISTRIBUTION.—San Ignacio south to Todos Santos and Las Cruces, and following islands: San José, Partida, Espíritu Santo, San Francisco.

NEW RECORDS.—**Baja California Sur, Mexico:** 16 km NW San Raymundo, 30–VI–1968 (Williams, Cazier); 6.4 km W La Purísima, 1–VII–1968 (Williams, Cazier); San Juanico, 1–VII–

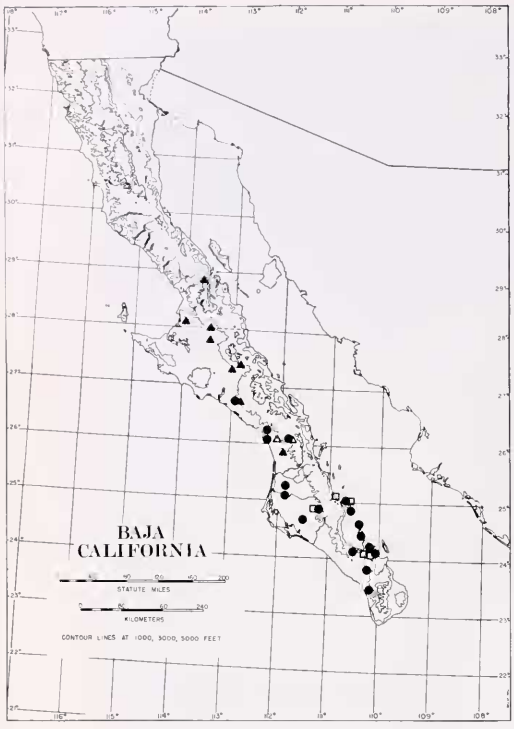

FIGURE 62. Distribution of *Vaejovis diazi diazi* (circles), *Vaejovis diazi transmontanus* (squares), *Vaejovis hoffmanni fuscus* (open triangles), and *Vaejovis hoffmanni hoffmanni* (closed triangles).

1968 (Bentzien); 10.5 km SW San Miguel Comondú, 3–VII–1968 (Williams, Cazier); 46.5 km W El Crucero, 26–VII–1968 (Williams, Cazier); 8.0 km W Misión San Luis Gonzaga, 21–V–1961 (Lindsay); Santa Rita, 27–VII–1968 (Williams, Bentzien, Bigelow); Isla San José, NW side, 25–III–1971 (Lee); Isla San Francisco, 11–VI–1970 (Lucas); Isla Partida, 9–VII–1968 (Williams, Fox, Bentzien); Isla del Espíritu Santo, Bahía Ballena, 24–V–1969 (Williams); 56.8 km NW Los Aripes, 27–VII–1968 (Williams, Bentzien, Bigelow); 8.0 km SW La Paz, 31–VII–1968 (Williams, Bentzien); 3.2 km E Pichilingue, 25–XI–1973 (Williams); 11 km W El Triunfo, 24–VII–1968 (Williams, Bentzien); 42 km N Todos Santos, 4–V–1969 (Williams).

REMARKS.—In the type-locality, on the Magdalena Plain, this species lived in relatively flat, rock-free terrain. The soils here were fine-textured, moderately packed sediment. In other parts of the geographic range, this species was found in predominantly rocky, volcanic habitats with loosely packed soils. Three morphological characters tended to vary over the geographic range: telson hirsuteness, body size, and emphasis of underlying dark pigment on the carapace and mesosomal dorsum. This is one of the most commonly encountered scorpions throughout much of its range.

Vaejovis diazi transmontanus Williams

(Figures 55*A*, 62, 63)

Vejovis diazi transmontanus WILLIAMS, 1970:415–417.

DIAGNOSIS.—Similar to *V. diazi diazi*, but differs as follows: telson vesicle similar in color to metasoma.

TYPE DATA.—*Vejovis diazi transmontanus*, holotype (male): CAS, Type No. 10414; coastal sand dunes, Punta San Telmo, Baja California Sur, Mexico, 26–V–1969, S. C. Williams.

DISTRIBUTION.—Eastern side of Sierra Giganta from Punta San Telmo to La Paz, and Isla San José.

NEW RECORDS.—**Baja California Sur, Mexico:** 8.0 km W Misión San Luis Gonzaga, 14–II–1966 (Roth, AMNH); Isla San José, 25–IV–1964 (Sloan, Croulet); 121 km NW La Paz, 4–VII–1968 (Williams, Cazier); La Paz, 7–IX–1963 (Craig, Warrington).

Vaejovis galbus Williams

(Figures 59, 64)

Vejovis galbus WILLIAMS, 1970:407–410. STAHNKE 1974:136.

DIAGNOSIS.—Adults to 38 mm long. Base color of body pale yellow, with faint underlying dusky markings on carapace and mesosoma. Metasoma with ventrolateral keels more smooth than crenulate on segments I–IV, ventromedian keels smooth to obsolete on segments I–IV, segment I wider than long, segment II as long as or longer than wide, segment III longer than wide, segment V 2.0–2.2 times longer than wide. Pedipalp with fingers moderately long, palm moderately slender; ratio of movable-finger length to carapace length 0.7–0.8; ratio of chela length to palm width 3.4–4.1; ratio of movable-finger length to palm width 2.1–2.5; supernumerary granules 6 on fixed finger, 7 on movable finger; primary-row denticles subdivided into 6 subrows by 5 slightly enlarged granules on fixed finger, subdivided into 7 subrows by 6 slightly enlarged granules on movable finger; fingers with obsolete scallop, palm with keels obsolete. Pectine teeth 12–15 in females, 16–18 in males. Telson vesicle bald and tubercular in male, vesicle hirsute in female.

TYPE DATA.—*Vejovis galbus*, holotype (male), allotype: CAS, Type No. 10415; 8.0 km S Loreto, Baja California Sur, Mexico, 16–V–1969, S. C. Williams.

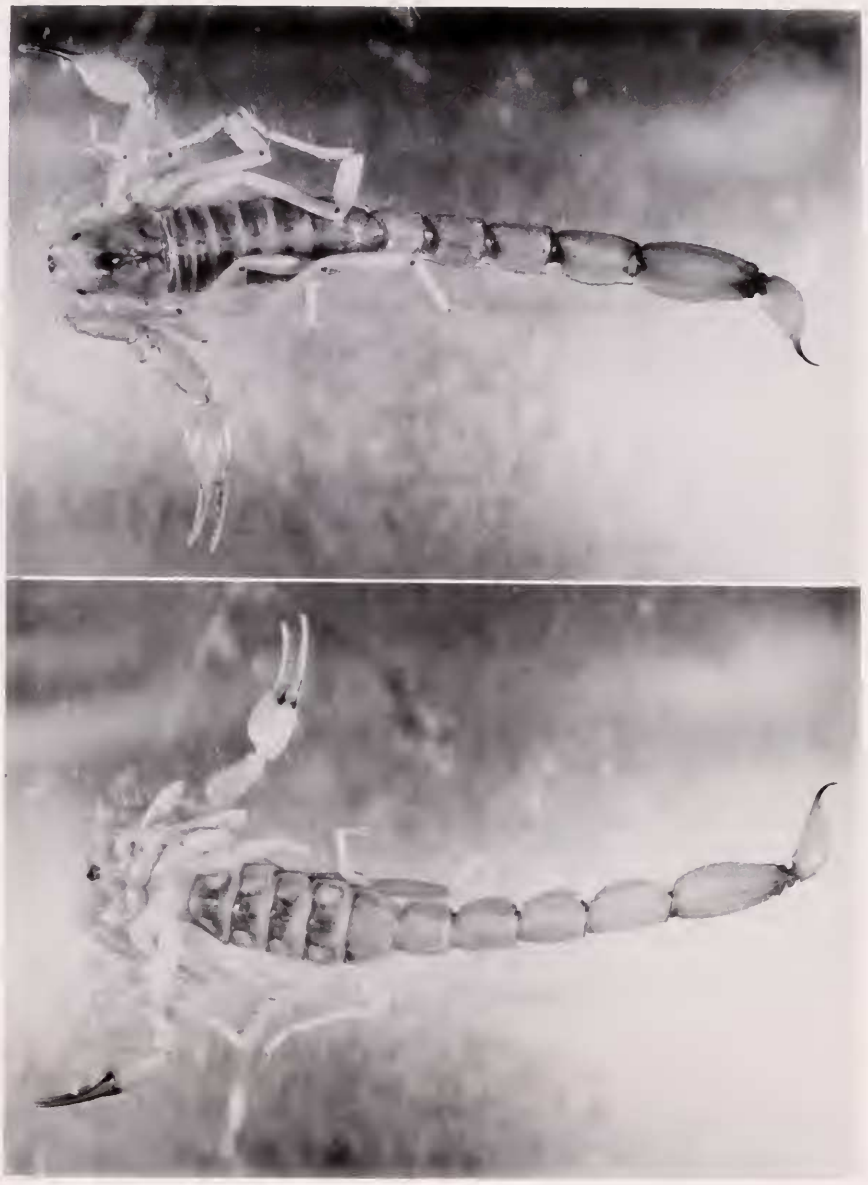

FIGURE 63. *Vaejovis diazi transmontanus*, topoparatype, male, dorsal and ventral views.

DISTRIBUTION.—San José de Comondú south to Santa Rita.

NEW RECORDS.—**Baja California Sur, Mexico:** 35 km N San José de Comondú, 16–II–1966 (Roth, AMNH); Isla Danzante, 7–IV–1962 (Harbison, SDMNH); 27 km N Colonia de la Toba, 30–I–1965 (Roth, AMNH); Santa Rita, 26–VII–1971 (Real).

Vaejovis gravicaudus Williams

(Figures 65, 66)

Vejovis spinigerus (Wood) [part]. DIAZ-NAJERA 1964:21.

Vejovis gravicaudus WILLIAMS, 1970:325–331. STAHNKE 1974:135.

DIAGNOSIS.—Adults to 65 mm long. Base color of body brownish yellow with underlying dusky markings; two pairs of more or less obsolete dark longitudinal stripes on mesosomal dorsum, two pairs more or less distinct stripes underlying ventromedian and ventrolateral keels of metasoma; pedipalp fingers similar to palm in

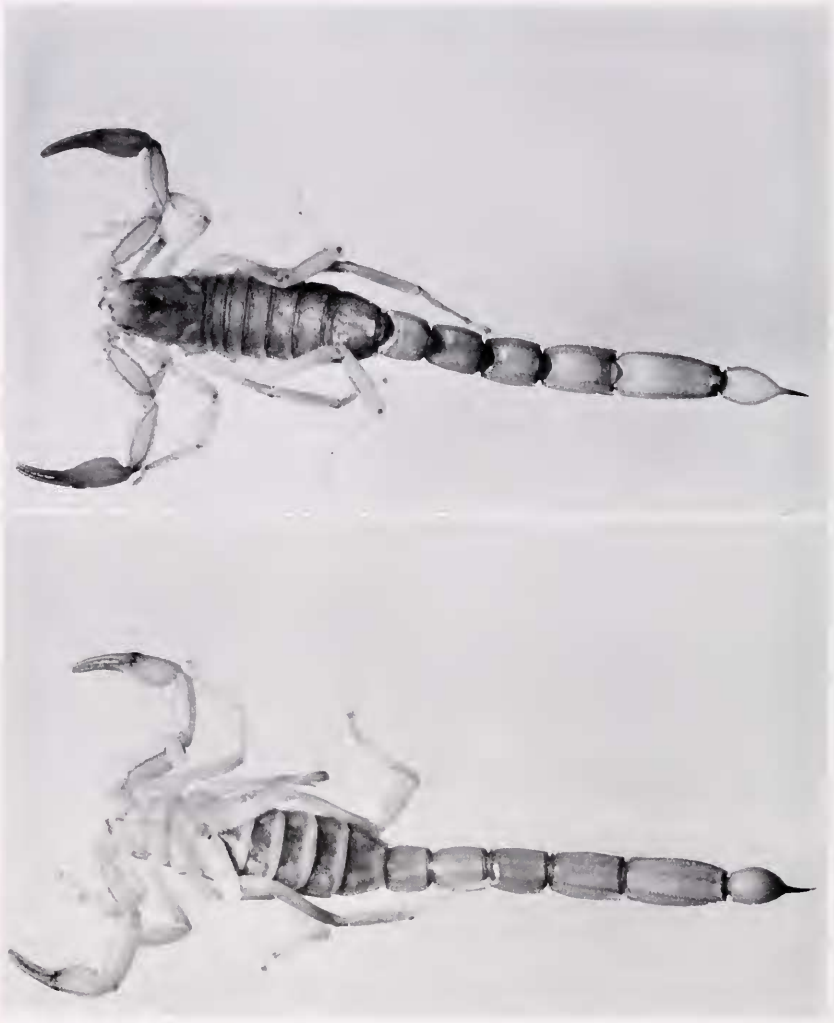

FIGURE 64. *Vaejovis galbus*, holotype, male, dorsal and ventral views.

color; pedipalp with palm slightly swollen, palm keels obsolete, palm smooth and agranular; ratio of movable-finger length to carapace length 0.8–0.9; ratio of chela length to palm width 3.1–4.3; ratio of movable-finger length to palm width 2.1–2.6; supernumerary granules 6 on fixed finger, 7 on movable finger, movable finger with primary row of denticles subdivided into six subrows by five slightly enlarged denticles, movable finger with most proximal supernumerary granule not paired with adjacent enlarged denticle in primary row; pedipalp fixed finger with primary row of denticles separated into 6 subrows of denticles by five slightly enlarged denticles; fixed finger with proximal supernumerary granule closely paired with adjacent enlarged denticle in primary row; pectine teeth 19–23 in females, 24–27 in males. Metasoma with ventrolateral keels greatly reduced and smooth, ventromedian keels obsolete, segment IV with depth distinctly greater than depth of segment I.

Similar to *Vaejovis spinigerus* but differs as follows: mature female with vesicle distinctly more hirsute, mature male with vesicle distinctly less hirsute; larger proximal space between fingers when chela closed; dorsal stripes on mesosoma not distinct (even in young instars).

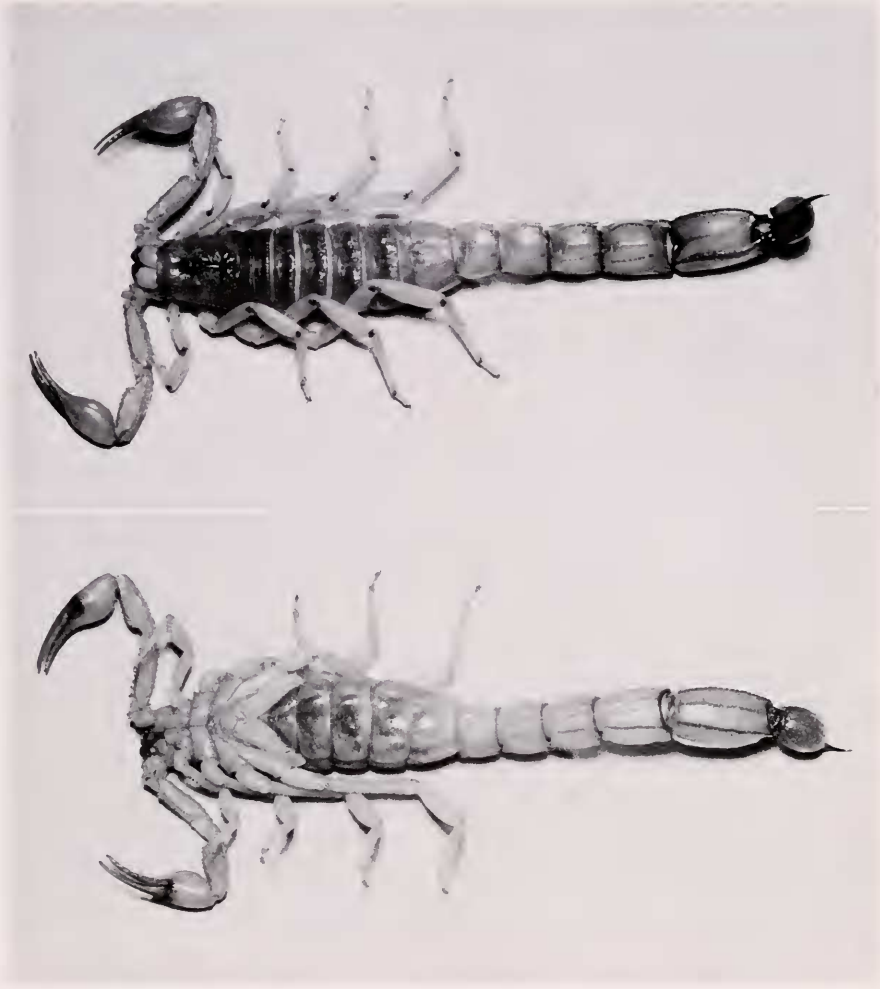

FIGURE 65. *Vaejovis gravicaudus*, holotype, male, dorsal and ventral views.

TYPE DATA.—*Vejovis gravicaudus*, holotype (male), allotype: CAS, Type No. 10418; 34.4 km W Los Aripes, 25–VII–1968, S. C. Williams, J. Bigelow, M. M. Bentzien.

DISTRIBUTION.—El Mármol south to La Paz and following islands: Tiburón, San Marcos, Carmen, San José, and San Francisco.

NEW RECORDS.—**Baja California Norte, Mexico:** 37 km S El Mármol, Rancho San Luis, 12–I–1965 (Roth, AMNH). **Baja California Sur:** 26 km S Santa Rosalía, 19–IV–1969 (Williams); Isla San Marcos, SW end, 19–III–1971 (Lee); San Ignacio, 24–VI–1968 (Williams, Cazier); 29 km S Mulegé, 20–IV–1969 (Williams); Bahía Concepción, El Coyote, 17–II–1966 (Roth, AMNH); 1.6 km SW Rancho Canipolé, 15–V–1969 (Williams); 6.4 km W La Purísima, 1–VII–1968 (Williams, Cazier); 39 km NE San José de Comondú, 15–V–1969 (Williams); 8.0 km S Loreto, 16–V–1969 (Williams); 0.8 km W Rancho Las Parras, 26–V–1970 (Lee, Williams); Isla Carmen, Puerto Balandra, 24–V–1970 (Williams, Lee); Puerto Nopalo, 12–IV–1962 (Belvedere Expedition); Rancho Chenque, N Puerto Escondido, 7–IV–1962 (Belvedere Expedition); 6.4 km S Misión San Javier, 18–V–1969 (Williams); Isla San José, SW side, 19–V–1970 (Williams, Lee); Isla San Francisco, S end, 10–IV–1974 (Banta). **Sonora:** Agua Dulce Bay, Tiburón Island, 18–III–1962 (Wiggins).

REMARKS.—Commonly encountered in rocky habitats. This species was most abundant in samples taken in the bottoms of canyons and washes where outcrops of volcanic rock and moderately packed soils were adjacent to each other.

FIGURE 66. Distribution of *Vaejovis gravicaudus* (squares) and *Vaejovis spinigerus* (circles).

Vaejovis hoffmanni Williams

Vejovis hoffmanni WILLIAMS, 1970:313–317. STAHNKE 1974:135.

DIAGNOSIS.—Adults to 37 mm long. Base color of body pale golden-yellow, with or without underlying dark or dusky marking on carapace. Ventrolateral keels of metasoma smooth to crenulate (basically smooth) on segments I–IV, ventromedian keels absent or obsolete on segments I–IV, segment I slightly wider than long, segment II with length approximating width, segment III slightly longer than wide. Pectine teeth 18–21 in males, 15–18 in females. Pedipalp with moderately short fingers; ratio of movable-finger length to carapace length 0.8–0.9; ratio of chela length to palm width 3.9–4.6; supernumerary granules 6 on fixed finger, 7 on movable finger, movable finger with primary-row denticles subdivided into 6 subrows by 5 slightly enlarged denticles, movable finger with most proximal supernumerary granule not paired with an adjacent enlarged denticle in primary row; fixed finger with primary-row denticles subdivided into 6 subrows of denticles by 5 slightly enlarged denticles; fixed finger with proximal supernumerary granule closely paired with adjacent enlarged denticle in primary row.

Similar to *Vaejovis eusthenura* and *Vaejovis diazi*. Distinguished from *V. eusthenura* as follows: pedipalp movable finger with primary-row denticles subdivided into 6 subrows (not 7 subrows), and with frontal margin of carapace set with three pairs setae (not 5 pairs). Distinguished from *V. diazi* as follows: chela more slender, ratio of chela length to palm width 4.0 or greater; pedipalp fixed finger with primary-row denticles subdivided into 6 subrows (not 7).

Vaejovis hoffmanni is represented by two endemic subspecies, *V. h. hoffmanni* and *V. h. fuscus*.

Vaejovis hoffmanni hoffmanni Williams

(Figures 62, 67)

Vejovis hoffmanni WILLIAMS, 1970:313–317.

DIAGNOSIS.—Similar to *Vaejovis hoffmanni fuscus* but differs as follows: uniform pale golden-yellow color of body and absence of underlying dark to dusky markings on carapace and mesosomal dorsum.

TYPE DATA. *Vejovis hoffmanni*, holotype (male), allotype: CAS, Type No. 10420; 4.8 km N Manuela, Baja California Norte, Mexico, 22–VI–1968, S. C. Williams, M. A. Cazier.

DISTRIBUTION.—Vizcaíno Desert south to La Purísima.

NEW RECORDS.—**Baja California Sur, Mexico:** 42 km S El Arco, 17–IV–1969 (Williams); 16 km NW San Raymundo, 30–VI–1968 (Williams, Cazier); 10 km S Rancho Los Ángeles, 18–IV–1969 (Williams).

Vaejovis hoffmanni fuscus Williams

(Figures 62, 68)

Vejovis hoffmanni fuscus WILLIAMS, 1970:413–415.

DIAGNOSIS.—Similar to *V. hoffmanni hoffmanni*, but differs as follows: carapace and dorsum conspicuously marked with dusky coloration; telson with more setae on vesicle; metasoma with ventrolateral keels more crenulate than smooth.

TYPE DATA.—*Vejovis hoffmanni fuscus*, holotype (male), allotype: CAS, Type No. 10421; 39 km NE San José de Comondú, Baja California Sur, Mexico, 15–V–1969, S. C. Williams.

DISTRIBUTION.—Volcanic region around San Miguel Comondú.

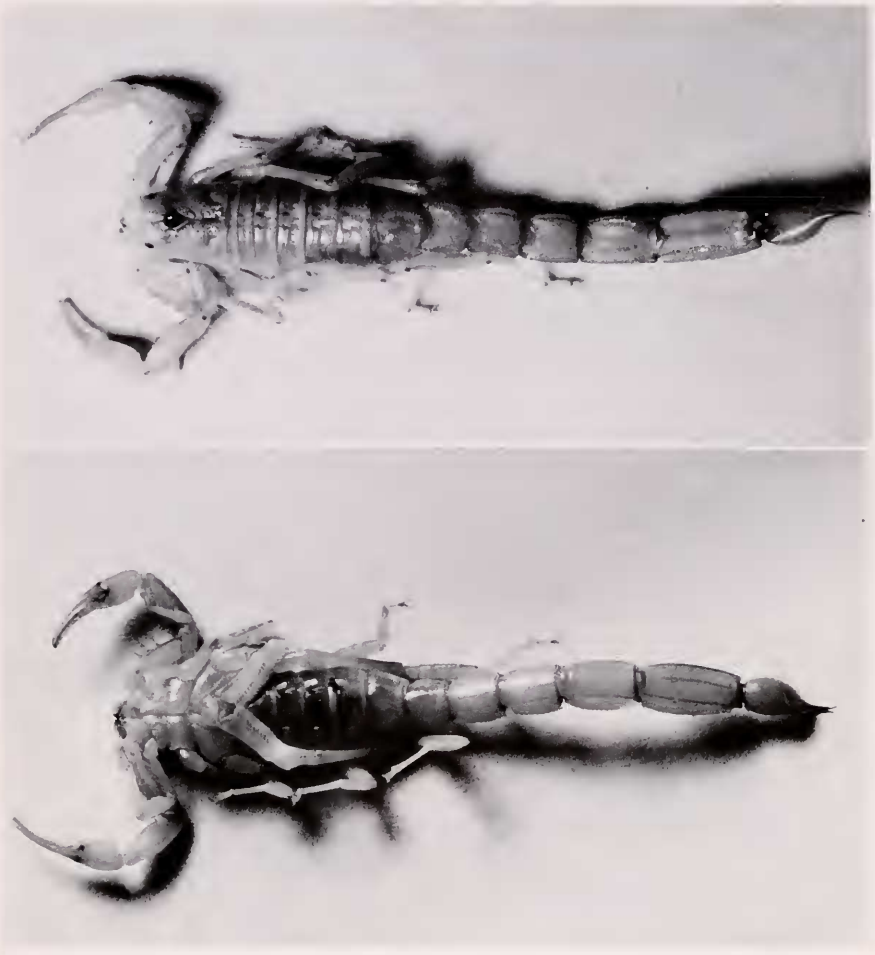

FIGURE 67. *Vaejovis hoffmanni hoffmanni*, holotype, male, dorsal and ventral views.

Vaejovis pattersoni Williams and Haradon, new species
(Figures 56*F*, 69, 75; Tables 1, 2)

DIAGNOSIS.—Prominent dorsal markings giving striped appearance. Pectine teeth 11–15 in males, 11–12 in females; females with proximal pectinal tooth distinctly smaller than other teeth in series; fourth and fifth enlarged denticles of primary dentate row retrolaterally offset on both pedipalp fingers; with distinct sharply pointed subaculear tooth on telson (Fig. 56*F*).

DESCRIPTION OF HOLOTYPE.—**Male.** Base color light yellow to yellow-orange; extensive dark fuscous markings on all body parts and appendages; dorsal mesosoma with two submedial and two lateral series of dark blotches giving appearance of stripes. Carapace surface lightly granular; anterior margin straight; median ocular tubercle set well forward of center of carapace. Terga lightly granular. Entire metasomal surface finely granular; dorsal and dorsolateral keels strongly crenulate to serrate; ventrolateral keels crenulate to serrate; ventromedian keels lightly granular on segment I, granular on segments II–V. Telson conspicuously smaller and narrower than metasomal segment V; ventral surface lightly tubercular, eight pairs of ventral and ventrolateral setae; distinct, well-developed subaculear tooth. Pedipalp palm surface smooth, keels obsolete; fingers scalloped proximally, form small gap when closed; 6 (fixed finger) and 7 (movable finger) large supernumerary gran-

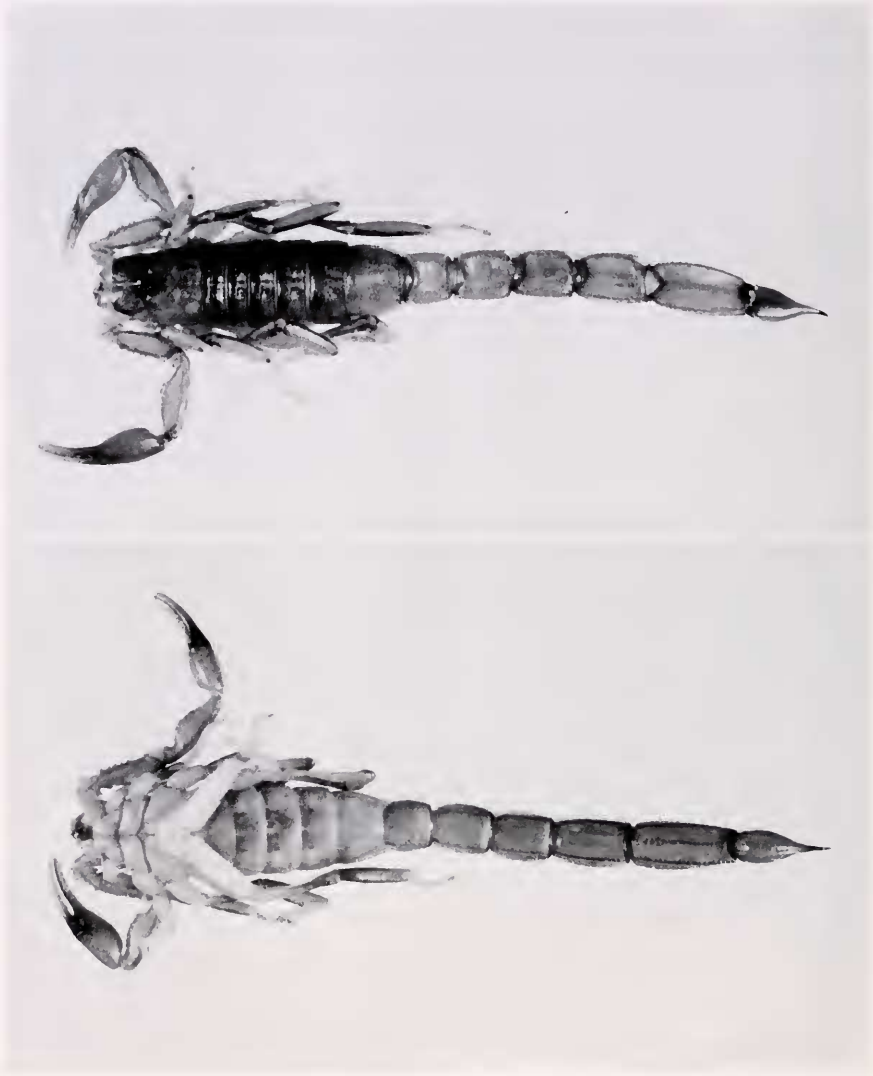

FIGURE 68. *Vaejovis hoffmanni fuscus*, paratype, male, dorsal and ventral views.

ules, set well away from primary row; primary-row denticles subdivided by 5 enlarged denticles on each finger, fourth and fifth enlarged denticles offset along retrolateral margin of each row; primary-row denticles do not extend to articulating margin.

VARIATION WITHIN PARATYPES.—Carapace length of males ranged 2.8–3.5 mm, females 2.9–3.7 mm. Pectine teeth 11–15 in males, 11–12 in females.

TYPE DATA AND ETYMOLOGY.—*Vaejovis pattersoni*, holotype (male), allotype and 24 topoparatypes: CAS, Type No. 12250; from the vicinity of La Laguna (elev. 1,707 m), Sierra de La Laguna, Baja California Sur, Mexico, 1–3–VIII–1974, R. M. Haradon, V. F. Lee, W. E. Savary. Named after Donald Patterson, who encouraged and supported biological exploration of Baja California.

DISTRIBUTION.—Known only from type-locality.

REMARKS.—Most specimens were found under the bark of dead trees, although several were found under rocks.

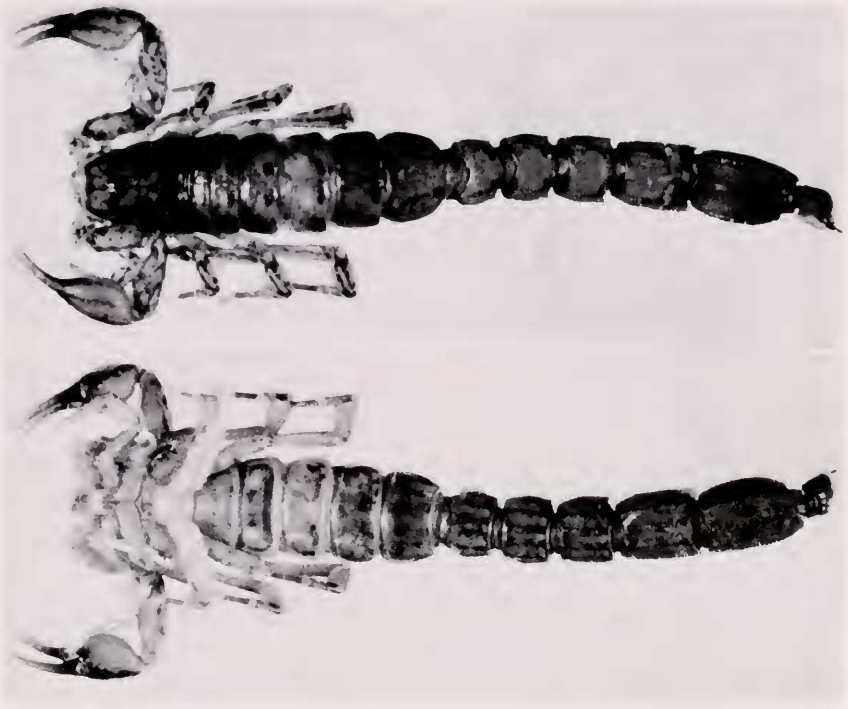

FIGURE 69. *Vaejovis pattersoni*, holotype, male, dorsal and ventral views.

Vaejovis puritanus Gertsch
(Figures 53*N*, 54*M*, 70, 71)
Vejovis puritanus GERTSCH, 1958:11–13.
Vejovis schwenkmeyeri WILLIAMS, 1970b:302–307. New synonym.
Vejovis terradomus WILLIAMS, 1970c:403–407. New synonym.

DIAGNOSIS.—Adults to 65 mm long. Base color of body golden-yellow, with or without contrasting dark underlying markings on carapace and mesosomal dorsum, pedipalp fingers slightly more reddish than palm. Metasoma with ventromedian keels smooth to obsolete on segments I–III, smooth with about 6 posterior crenulations on IV; ventrolateral keels smooth to subtly crenulate on segments I–III, crenulate on IV; segment I with length approximating width; segment II as long as wide or longer; segment III longer than wide; segment V 2.3–2.8 times longer than wide. Pedipalp moderately slender, ratio of movable-finger length to carapace length 0.9–1.1; ratio of chela length to palm width 3.9–4.4 in males, 4.6–5.3 in females; ratio of movable-finger length to palm width 2.5–3.0 in males, 3.1–3.6 in females; supernumerary granules 6 on fixed finger, 7 on movable finger; primary-row denticles subdivided into 5 subrows on fixed finger, 6 subrows on movable finger. Pectine teeth 17–19 in males, 14–17 in females.

Similar to *V. viscainensis* and *V. waeringi*. Distinguished from *V. viscainensis* as follows: metasoma length less than 8.5 times width of segment V; ratio of movable-finger length to palm width 3.5 or less in males, less than 3.8 in females; dorsal keels of segment III with fewer than 25 crenulations; pedipalp palm equal to or wider than brachium in width. Distinguished from *V. waeringi* as follows: pedipalp fixed finger with primary-row denticles separated into 5 subrows by 4 slightly enlarged denticles; pedipalp fixed finger with supernumerary granule 6 (proximal one) not closely paired with adjacent enlarged denticle in primary row.

TYPE DATA.—*Vejovis puritanus*, holotype (male): AMNH; Santo Tomás, Baja California Norte, 8–VII–1953, W. J. and J. W. Gertsch. Allotype: AMNH; Jacumba, San Diego County, California, 10–VIII–1955, W. J. Gertsch.

Vejovis schwenkmeyeri, holotype (male), allotype: CAS, Type No. 10426, Bahía de los Ángeles, Baja California Norte, Mexico, 19–VI–1968, S. C. Williams, M. A. Cazier.

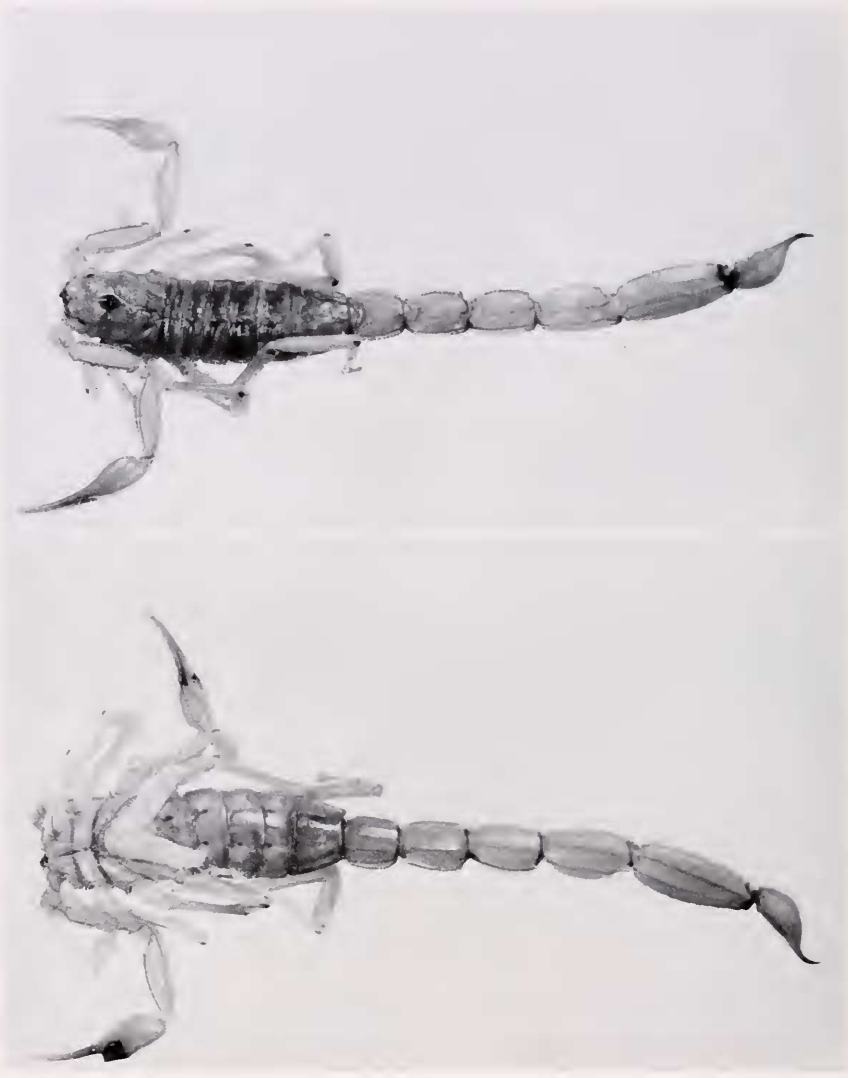

FIGURE 70. *Vaejovis puritanus*, male, dorsal and ventral views.

Vejovis terradomus, holotype (male): CAS, Type No. 10428; 1.6 km SW Rancho Canipole, Baja California Sur, Mexico, 15–V–1969, S. C. Williams.

DISTRIBUTION.—Baja California from Loreto to United States border; southern California. Puritanus race: San Ignacio north to southern California; Schwenkmeyeri race: La Purísima north to Puertecitos; Terradomus race: Loreto region.

NEW RECORDS.—Puritanus race: **Baja California Norte, Mexico:** 14 km E Tecate, 17–VII–1969 (Williams, Lee); 10 km S Tecate, 17–VII–1969 (Williams, Lee); 40 km S Tecate, 17–VII–1969 (Williams, Lee); 31 km N Rancho El Topo, Sierra Juárez, 16–VII–1969 (Williams, Lee); 11 km NE Rosarito, 30–IV–1973 (Doyen, CIS); La Misión, 14–VII–1969 (Williams, Lee); 6.4 km SE Ojos Negros, 15–VII–1969 (Williams, Lee); 8.0 km E Ensenada, 15–VII–1969 (Williams, Lee); 18 km E Puerto Santo Tomás, 11–VII–1969 (Williams, Lee); 3.2 km SE Eréndira, 12–VI–1973 (Williams, Blair); Punta Banda, 10–VII–1969 (Williams, Lee); 11 km N Santa María, 12–VII–1969 (Williams, Lee); 24 km E San Telmo de Arriba, 13–VII–1969 (Williams, Lee); La Grulla, Sierra San Pedro Mártir, 3–IX–1961 (Parrish); 11 km E Meling Ranch, Sierra San Pedro Mártir, 13–VII–1969 (Williams, Lee); San Telmo de Arriba, 3–V–1961 (Gertsch, Roth, AMNH); Mike's Sky Ranch, Sierra San Pedro Mártir, 14–15–VI–1973 (Williams, Blair); Bahía San

Quintín, 22–VII–1968 (Rodrigues); 11 km N Santa María, 12–VII–1969 (Williams, Lee); Socorro Sand Dunes, 12–VII–1969 (Williams, Lee); El Rosario, 6–IV–1969 (Williams); 17 km E El Rosario, 5–V–1961 (Gertsch, Roth, AMNH); 37 km S El Mármol, Rancho San Luis, 12–I–1965 (Roth, AMNH); 6.4 km S El Arenoso, 8–IV–1969 (Williams); 3.2 km NW Santa Ynez Ranch, 27–III–1973 (Doyen, CIS); Misión Calamajué, 3–X–1973 (Doyen, CIS); 36.4 km NW Laguna Chapala, 27–V–1961 (Lindsay); 11 km W La Borja, 22–II–1966 (Snelling, LACM); Isla Cedros, 13–17–IV–1963 (Banks). **Baja California Sur:** 27 km E San Ignacio (Misión), 25–I–1965 (Roth, AMNH).

Schwenkmeyeri race: **Baja California Norte, Mexico:** 0.8 km S La Virgen, 8–IV–1969 (Williams); 18 km N Rancho Mezquital, 15–IV–1969 (Williams). **Baja California Sur:** 42 km S El Arco, 17–IV–1969 (Williams); 4.8 km SE Rancho Tablón, 23–VI–1968 (Williams, Cazier); Isla Coronados, SW end, 25–V–1970 (Williams, Lee).

Terradomus race: **Baja California Norte, Mexico:** 39 km S Santa Inés, 7–VII–1973 (Williams, Blair). **Baja California Sur:** 4.8 km NW San Ignacio, 22–II–1966 (Roth, AMNH); Isla Coronados, 3–IV–1962 (Belvedere Expedition).

REMARKS.—*Vaejovis puritanus* is a variable, widely distributed species. Originally it was recognized as three allopatric species: *V. puritanus*, *V. schwenkmeyeri*, and *V. terradomus*. These three are distinguished by color pattern, ratio of body parts, and pedipalp-scallop size, but they appear to be geographic races and are here referred to as the puritanus race, the schwenkmeyeri race, and the terradomus race. The puritanus race occurs along the Pacific coast and foothill regions of southern California and Baja California. It can be recognized by having carapace and mesosomal dorsum with conspicuous dusky to dark markings, and pedipalps of mature males with a very small open space remaining between fingers with chela closed. The schwenkmeyeri race occurs in the desert regions of the Baja California peninsula in the upper Gulf of California region and differs from puritanus in being pale yellow in color (lacking dark or dusky underlying markings), and by having mature-male pedipalps with a large distinct space remaining proximally between fingers with chela closed. The terradomus race occurs further to the south and east and generally has faint, underlying, dusky markings, somewhat like puritanus, and with open pedipalp gap between fingers like that in schwenkmeyeri. Terradomus tends to have the ventrolateral keels of the metasoma more crenulate than in puritanus and schwenkmeyeri.

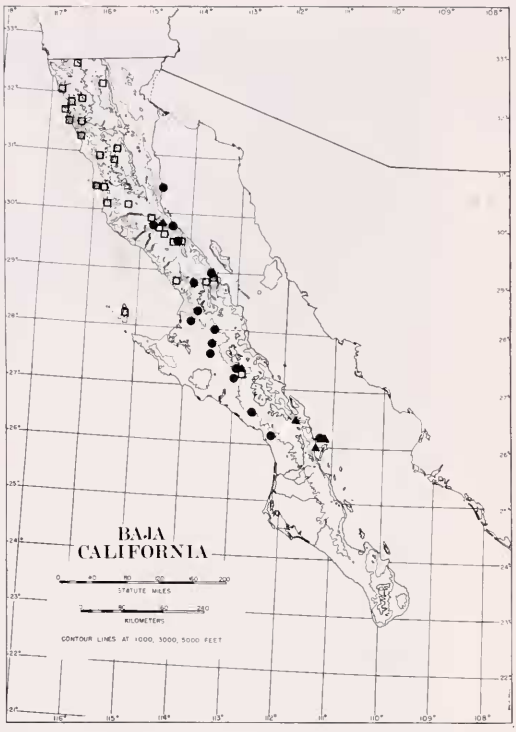

FIGURE 71. Distribution of *Vaejovis puritanus*: puritanus race (squares), schwenkmeyeri race (circles), and terradomus race (triangles).

Vaejovis spinigerus (Wood)

(Figures 55*D*, 66, 72)

Buthus spinigerus WOOD, 1863a:110; 1863b:370.

Vejovis spinigerus (Wood). KRAEPELIN 1894:203; 1899:187. BANKS 1910:187. HOFFMANN 1931:349–350. STAHNKE 1974:135.

Vaejovis spinigerus (Wood). EWING 1928:13.

DIAGNOSIS.—Adults to 68 mm long. Base color of body light brownish yellow, mesosomal dorsum with underlying dusky pigmentation forming one pair more or less distinct longitudinal stripes; metasoma with position of ventromedian and ventrolateral keels outlined as thin black stripes. Metasoma stout, segments I and II wider than long, width of segment III approximating length or slightly wider, segment IV longer than wide, segment V 1.7–1.9 times longer than wide, mature individuals with segment V wider than segments I–III; ventrolateral keels smooth and reduced, ventromedian keels obsolete, dorsal keels distinctly raised compared to dorsolateral keels. Pedipalp with moderate fingers and moderate palm; ratio of movable-finger length to carapace length 0.8–0.9; ratio of chela length to palm width 3.2–3.7; ratio of movable-finger length to palm width 2.0–2.3; supernu-

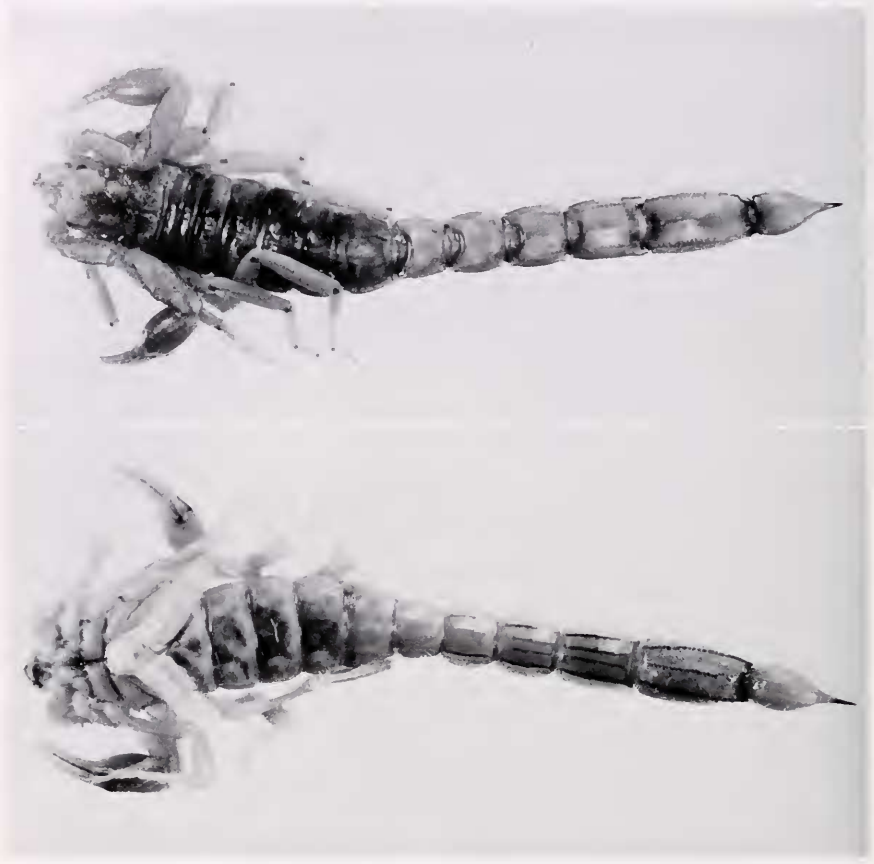

FIGURE 72. *Vaejovis spinigerus*, male, dorsal and ventral views.

merary denticles 6 on fixed finger, 7 on movable finger; primary-row denticles subdivided into 6 subrows on fixed finger, 7 subrows on movable finger; palm smooth, keels absent to obsolete, palm surface smooth and lustrous. Pectine teeth 22–27 in males, 16–22 in females.

Similar to *Vaejovis gravicaudus* but differs as follows: pedipalp movable finger with principal-row denticles subdivided into 7 subrows by 6 slightly enlarged denticles; pedipalp movable finger with seventh (most proximal supernumerary denticle) closely paired with adjacent enlarged denticle in primary row.

TYPE DATA.—*Buthus spinigerus*, syntypes: USNM, S-9, Jar 3 (2 males, 1 female); and S-10, Jar 3 (2 males), "Texas."

DISTRIBUTION.—Baja California Norte: Colorado Desert region around Algodones and Río Hardy Fish Camp; Sonora; California, Arizona, New Mexico, and Texas.

NEW RECORDS.—**Baja California Norte, Mexico:** Algodones, 18–VII–1969 (Williams, Lee); 3.2 km S Algodones, 18–VII–1969 (Williams, Lee); Río Hardy Fish Camp, 19–VII–1969 (Williams, Lee); 6.4 km N Río Hardy Fish Camp, 19–VII–1969 (Williams, Lee).

Vaejovis viscainensis Williams

(Figures 53*O*, 54*L*, 59, 73)

Vejovis viscainensis WILLIAMS, 1970c:410–413.
Paruroctonus viscainensis (Williams). STAHNKE 1974a:138.

DIAGNOSIS.—Adults to 50 mm long. Base color of body uniform pale whitish yellow with very faint dusky underlying pigmentation. Metasoma with ventrolateral keels finely crenulate on segments I–IV, ventromedian keels smooth on segments I and II, smooth to finely crenulate on III, finely crenulate on IV; segment I as long or slightly longer than wide, segment II longer than wide, segment V 2.7–2.9 times longer than wide. Pedipalp with very elongate fingers and very slender palm, ratio of movable-finger length to

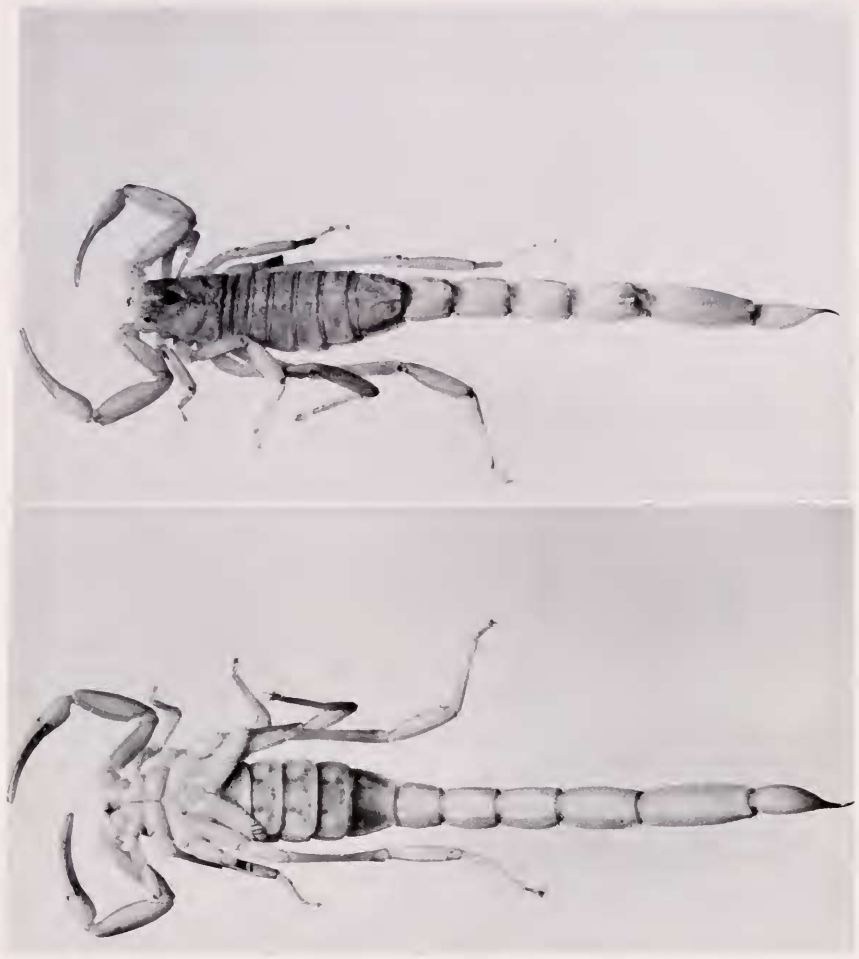

FIGURE 73. *Vaejovis viscainensis*, holotype, male, dorsal and ventral views.

carapace length 1.0–1.1; ratio of movable-finger length to palm width 4.2–4.3; ratio of chela length to palm width 5.8–6.2; fingers not scalloped; palm with keels smooth to obsolete, supernumerary denticles 6 on fixed finger, 7 on movable finger, primary-row denticles subdivided into 5 subrows on fixed finger, 6 subrows on movable finger. Pectine teeth 16–17 in males, 14–15 in females.

Similar to *V. puritanus* but differs as follows: ratio of movable-finger length to palm length 4.0 or greater; males with 15–16 pectine teeth (not 17–19); pedipalp palm distinctly narrower than brachium (not with palm approximating brachium in width or wider).

TYPE DATA.—*Vejovis viscainensis*, holotype (male): CAS, Type No. 10429; 3.2 km NW Miller's Landing, Baja California Norte, Mexico, 21–VI–1968, S. C. Williams, M. A. Cazier. Allotype: CAS; 23 km S Guerrero Negro, Baja California Sur, Mexico, 16–IV–1969, S. C. Williams.

DISTRIBUTION.—Vizcaíno Desert from Miller's Landing south to San Raymundo.

NEW RECORDS.—**Baja California Norte, Mexico:** 4.8 km N Manuela, 22–VI–1968 (Williams, Cazier). **Baja California Sur:** 42 km S El Arco, 17–IV–1969 (Williams); 32 km S Santa Rosalía, 19–IV–1969 (Williams); 10 km S Santa Rosalía, 19–IV–1969 (Williams); 13 km NW San Raymundo, 30–VI–1968 (Williams, Cazier).

REMARKS.—This species is endemic to the sandy habitats of the Vizcaíno Desert and is rare.

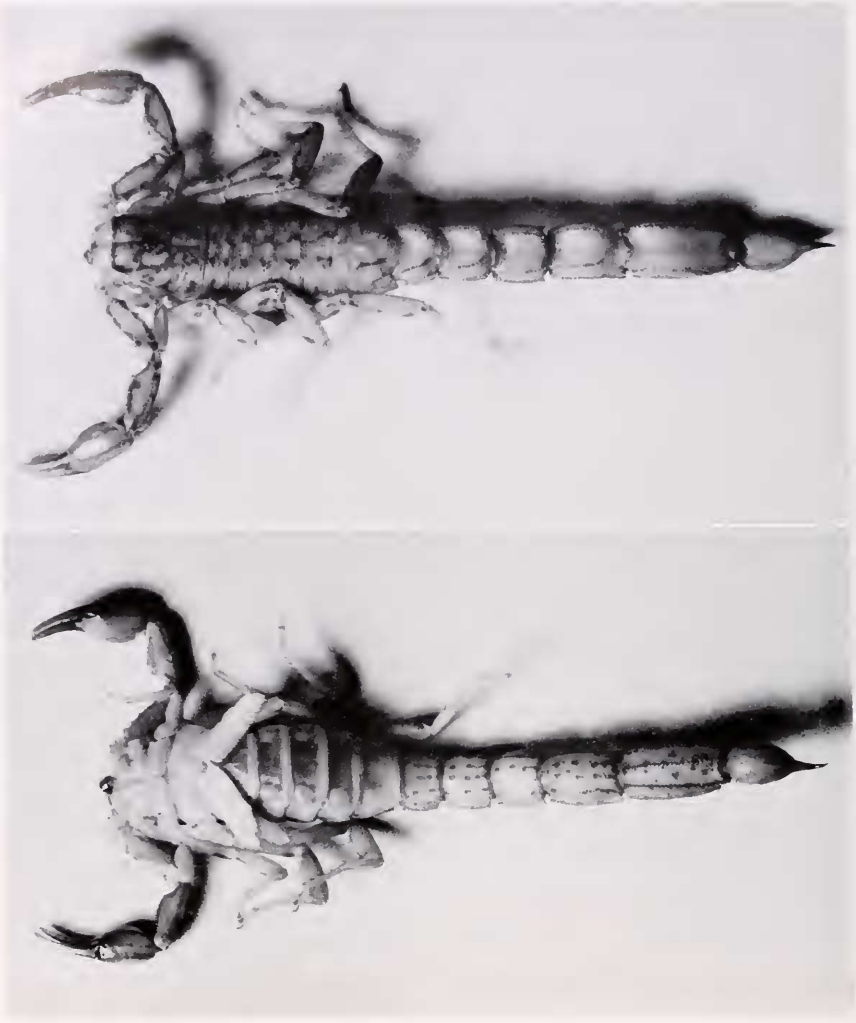

FIGURE 74. *Vaejovis vittatus*, holotype, male, dorsal and ventral views.

Vaejovis vittatus Williams

(Figures 74, 75)

Vejovis vittatus WILLIAMS, 1970b:290–297.

DIAGNOSIS.—Adults to 36 mm long. Base color yellow, two pairs dorsal mesosomal stripes, metasoma with melanic speckling along ventromedian and ventrolateral keel regions, body with general speckled appearance, pedipalp fingers contrastingly reddish brown compared to yellow palm. Pedipalps with short fingers, ratio of movable-finger length to carapace length 0.7–0.8; ratio of chela length to palm width 3.2–3.8; supernumerary granules 6 on fixed finger, 7 on movable finger; primary-row denticles of movable finger subdivided into 6 subrows by 5 slightly enlarged denticles; movable finger with seventh (most proximal) supernumerary granule not paired with an adjacent enlarged denticle in primary row; fixed finger with primary-row denticles subdivided into 6 subrows by 5 slightly enlarged denticles, fixed finger with supernumerary granule 6 (proximal one) closely paired with an adjacent enlarged denticle in primary row; pectine teeth 18–22 in males, 15–18 in females.

Similar to *Vaejovis punctatus punctatus* but differs as follows: mature individuals with smaller body size; frontal margin of carapace with 4 or 5 pairs long setae and one long median seta

(not with three pairs setae and no median seta); ventrolateral keels of metasoma crenulate (not smooth); lacking proximal scallop on pedipalp chela of mature males. Similar to *Vaejovis pattersoni* but differs as follows: small rounded subaculear tubercule on telson (not with pointed subaculear tooth).

TYPE DATA.—*Vejovis vittatus*, holotype (male), allotype: CAS, Type No. 10430; 8.0 km SW San Miguel Comondú, Baja California Sur, Mexico, 2–3–VII–1968, S. C. Williams, M. A. Cazier.

DISTRIBUTION.—San José de Comondú south to Cabo San Lucas, and following islands: Coronados, Partida, Espíritu Santo, Cerralvo.

NEW RECORDS.—**Baja California Sur, Mexico:** 1.6 km S Loreto, 17–V–1969 (Williams); Isla Coronados, SW end, 25–V–1970 (Williams, Lee); 6.4 km S Misión San Jávier, 18–V–1969 (Williams); 27 km N Colonia de la Toba, 30–I–1965 (Roth, AMNH); Isla Cerralvo, Piedras Gordas, 17–V–1970 (Williams, Lee); El Triunfo, 3–II–1965 (Roth, AMNH); 0.5 km S Rancho Buena Vista, 6–V–1969 (Williams); Sierra de la Laguna, 6–IV–1947 (LaRivers, CIS); Bahía de los Frailes, 9–III–1947 (LaRivers, CIS); Boca de la Sierra, 10–II–1966 (Roth, AMNH); 27 km N San José del Cabo, 9–II–1966 (Roth, AMNH).

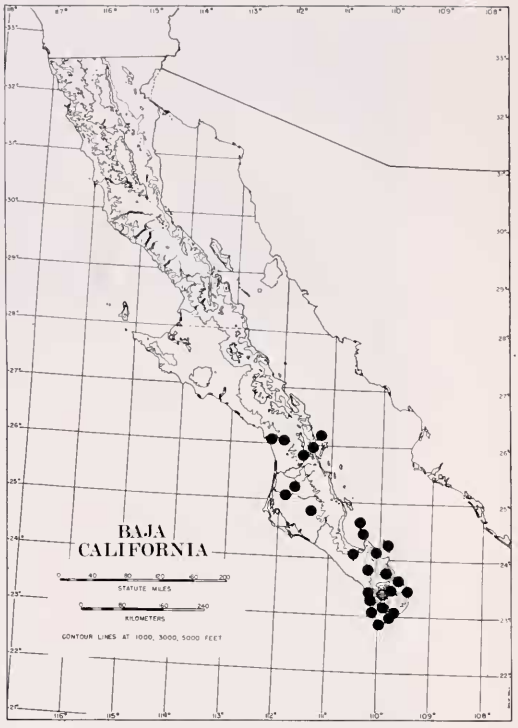

FIGURE 75. Distribution of *Vaejovis vittatus* (closed circles) and *Vaejovis pattersoni* (open circles).

Vaejovis waeringi Williams

(Figures 53*Q*, 54*K*, 55*C*, 59, 76)

Vejovis waeringi WILLIAMS, 1970c:397–400. STAHNKE 1974a:135.

Vejovis coloradensis WILLIAMS, 1970c:401–403. STAHNKE 1974a:135–136.

DIAGNOSIS.—Adults to 55 mm long. Base color uniform pale yellow, no distinctive color markings. Metasoma with ventrolateral keels crenulate on segments I–IV, ventromedian keels smooth on I, smooth with several crenulations on II; smooth to crenulate on III, irregularly crenulate on IV; segment I wider than long, segment II length approximates width, segment III longer than wide, segment V 1.7–2.1 times longer than wide. Pedipalp with narrow palm, fingers elongate; ratio of movable-finger length to carapace length 0.9–1.1; ratio of chela length to palm width 4.6–6.0; ratio of movable-finger length to palm width 3.2–4.0; supernumerary granules 6 on fixed finger, 7 on movable finger, primary-row denticles subdivided into 6 subrows by 5 slightly enlarged denticles on movable and on fixed fingers; palms with keels low and inconspicuous, with low rounded granules; fingers with long narrow proximal scallop. Pectine teeth 12–14 in females, 15–18 in males.

Similar to *Vaejovis puritanus* and *Vaejovis confusus*. Differs from *V. puritanus* as follows: pedipalp fixed finger with primary-row denticles subdivided into 6 subrows by 5 slightly enlarged denticles (not subdivided into 5 subrows by 4 slightly enlarged denticles); ratio of metasoma total length to width of segment V 6.0–7.1 (not 7.5–8.1); ratio of chela length to palm width 5.7–6.0 in males (not 3.9–4.4). Differs from *V. confusus* as follows: ratio of fixed-finger length to palm length 1.2–1.4 (not 1.0–1.1); ratio of chela length to palm width greater than 5.0 in males, greater than 4.3 in females; ratio of palm width to brachium width 1.0 or less.

TYPE DATA.—*Vejovis waeringi*, holotype (male), allotype: CAS, Type No. 10431; Oakie Landing, 43 km S Puertecitos, Baja California Norte, Mexico, 12–VI–1968, S. C. Williams, M. A. Cazier.

Vejovis coloradensis, holotype (male), allotype: CAS, Type No. 104113, 3.2 km W Andrade, Imperial County, California, 6–VII–1969, S. C. Williams, V. F. Lee.

DISTRIBUTION.—Upper Gulf region from Al-

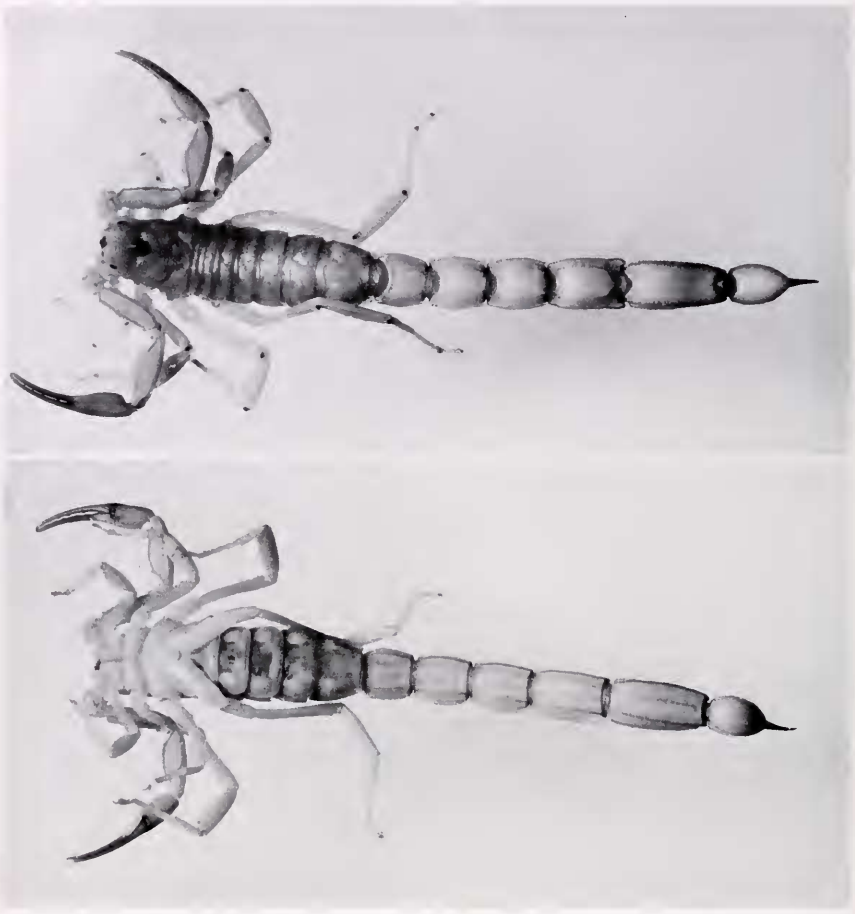

FIGURE 76. *Vaejovis waeringi*, holotype, male, dorsal and ventral views.

godones south to Oakie Landing, and east of Sierra San Pedro Mártir and Sierra Juárez.

NEW RECORDS.—**Baja California Norte, Mexico:** Guadalupe Canyon, E side Sierra Juárez, 18–VI–1973 (Williams, Blair); 17 km S Pozo Demara, Laguna Salada, 20–VI–1971 (Cross); Persebú, 23–VI–1973 (Williams, Blair).

Genus **Vaejovis**: minimus subgroup

The minimus subgroup is distinguished from others as follows: carapace with frontal margin usually deeply bilobed; genital operculum of female not completely fused longitudinally; pedipalp with hand heavy, flattened, and wide; ratio of palm width to palm depth usually greater than 1.05; pectine usually small, usually supported by 9 or fewer middle lamellae; pectine teeth 7–12 in females, 8–13 in males; movable finger of pedipalp distinctly shorter than carapace; pedipalp fingers not terminating distally in enlarged clawlike tooth.

The following five Baja California species are members of the minimus subgroup: *V. minimus castaneus*, *V. andreas*, *V. lindsayi*, *V. montcazieri*, and *V. rufulus*.

Vaejovis andreas (Gertsch and Soleglad)

(Figures 55*F*, 77, 78)

Uroctonus andreas GERTSCH AND SOLEGLAD, 1972:587–589.
Vejovis andreas (Gertsch and Soleglad), STAHNKE 1974a:136.

DIAGNOSIS.—Adults to 22 mm long. Base color of cuticle uniform golden-brown. Cuticle densely granulose. Pectine teeth 7–9 in females, males 8–10. Metasoma with ventromedian and ventrolateral keels crenular; metasomal segment III as long as or slightly longer than wide. Pedipalp movable finger with 6 supernumerary

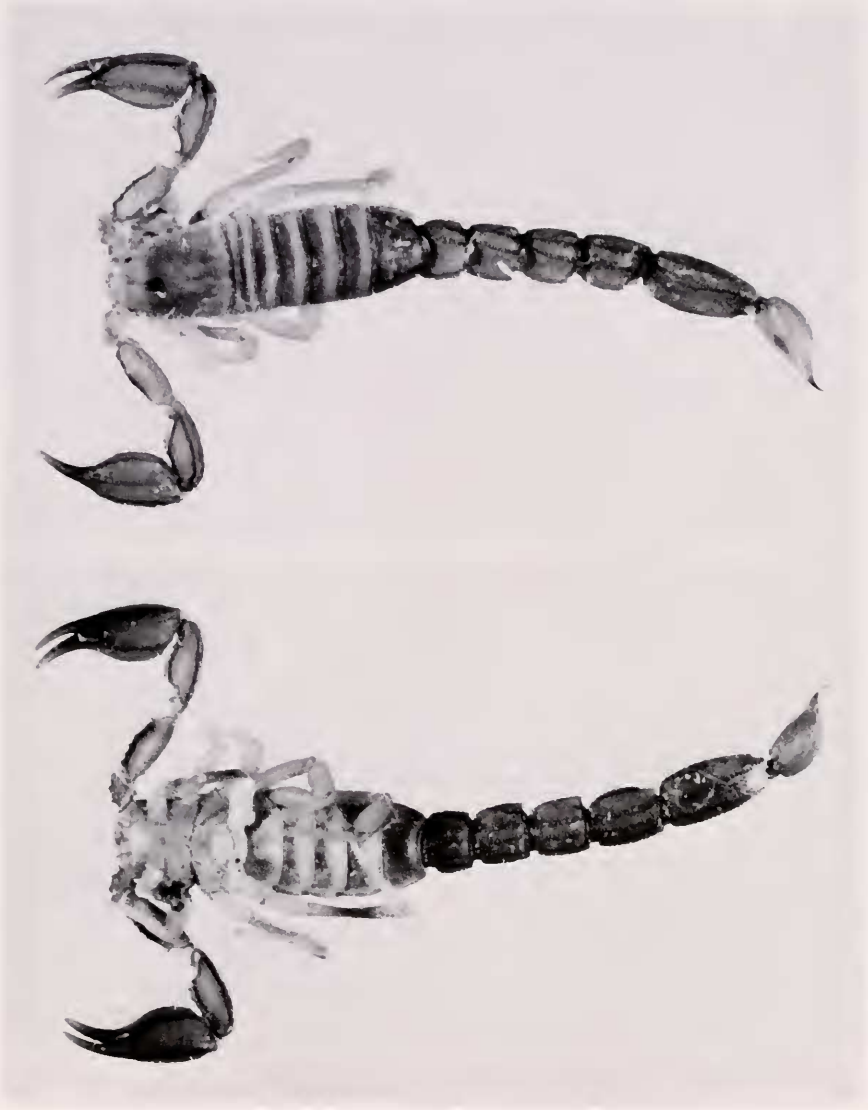

FIGURE 77. *Vaejovis andreas*, male, dorsal and ventral views.

granules; pedipalp with palm greatly swollen; ratio of movable-finger length to palm width 1.8 or less. Pedipalp fixed finger with trichobothria *id* and *ip* on finger origin directly above movable-finger articulation.

Similar to *V. rufulus* and *V. lindsayi* from which it is distinguished by 6 supernumerary granules on pedipalp movable finger (not 7).

TYPE DATA.—*Uroctonus andreas*, holotype (female): AMNH; Andreas Canyon, off Palm Canyon, 6.4 km S Palm Springs, Riverside County, California, 26-III-1960, W. J. Gertsch, W. Ivie, R. Schrammel.

DISTRIBUTION.—Baja California, Sierra Juárez and Ojos Negros Valley; southern California.

Vaejovis lindsayi (Gertsch and Soleglad)

(Figures 78, 79)

Uroctonus lindsayi GERTSCH AND SOLEGLAD, 1972:568, 585–587.

Vejovis lindsayi (Gertsch and Soleglad). STAHNKE 1974a:136.

DIAGNOSIS.—Adults to 34 mm long. Base col-

FIGURE 78. Distribution of *Vaejovis andreas* (circles), *Vaejovis lindsayi* (open triangles), *Vaejovis montcazieri* (squares), and *Vaejovis rufulus* (closed triangles).

or uniformly tan to reddish brown. Pedipalp with chela swollen; ratio of movable-finger length to carapace length 0.7–0.8; ratio of chela length to width about 2.8–3.0; ventral keel of palm developed and granular; supernumerary granules 7 on movable, 6 on fixed finger. Metasoma with segment III width approximating length, segments I and II wider than long; ventromedian and ventrolateral keels crenular. Pectine teeth 14 in males, 12–13 in females.

Similar to *V. rufulus* but differs as follows: lack of distinctly developed, angular, granular ventral keel on the pedipalp palm, trichobothrium *ip* slightly distal to movable-finger articulation.

TYPE DATA.—*Uroctonus lindsayi*, holotype (female): SDMNH; Sierra Laguna, Baja California Sur, Mexico, 14–III–1965, R. C. Banks.

DISTRIBUTION.—Sierra Laguna.

Vaejovis minimus Kraepelin

DIAGNOSIS.—Adults to 30 mm long. Metasoma short, stout, segments I through III distinctly wider than long, segment IV with length approximating width; segment V 1.3–1.4 times longer than wide; ventromedian and ventrolateral keels well developed, crenular. Pedipalp with short fingers, palms swollen; ratio of movable-finger length to carapace length 0.8–0.9; ratio of chela length to palm width 2.3–2.4; ratio of movable-finger length to palm width 1.4–1.5; supernumerary granules 6 on fixed finger, 6 or 7 on movable finger. Pectine teeth 10–11 in males, 9–10 in females.

Similar to *V. rufulus* and *V. baueri* but differs from *V. rufulus* as follows: metasomal segment III wider than long (not as wide as long or longer); metasomal segment IV as wide as long (not distinctly longer than wide). Differs from *V. baueri* as follows: pedipalp fingers not terminating distally in conspicuous elongate, toothlike denticle; fixed pedipalp finger with terminal denticle length less than ¾ depth of finger at first supernumerary granule; metasomal segment V not wider than segment III.

Vaejovis minimus castaneus Gertsch and Soleglad

Vejovis minimus castaneus GERTSCH AND SOLEGLAD, 1972:600.

DIAGNOSIS.—Similar to *Vaejovis minimus minimus*, but differs as follows: pedipalp movable finger with 7 supernumerary granules (not 6).

TYPE DATA.—*Vejovis minimus castaneus*, holotype (female): SDMNH; Santee, San Diego County, California, 28–I–1965, M. Keaher.

DISTRIBUTION.—Coastal San Diego County, California, and probably into Baja California Norte.

Vaejovis montcazieri Williams, new name

(Figures 55*G*, 78, 80)

Uroctonus cazieri GERTSCH AND SOLEGLAD, 1972:582–584.
Vejovis cazieri (Gertsch and Soleglad) [not *Vaejovis cazieri* Williams, 1968]. STAHNKE 1974a:136 [junior homonym].

DIAGNOSIS.—Adults to 32 mm long. Base color of cuticle uniform golden-brown. Pectine teeth 10–12 in females, 12 in males. Pedipalp with swollen chela; ratio of movable-finger length to carapace length about 0.8; ratio of fixed-finger length to palm length about 0.3; ratio of chela length to palm width about 3.0. Chelicera with ventral margin of movable finger with about 5 weakly developed crenulations; 7 supernumerary granules on movable finger, 6 on fixed finger; fixed finger with trichobothria *ip*

FIGURE 79. *Vaejovis lindsayi*, holotype, female, dorsal and ventral views.

and *id* midway between finger origin and supernumerary granule 7. Metasoma with ventromedian and ventrolateral keels crenulate; length metasoma segment III approximating width.

TYPE DATA.—*Uroctonus cazieri*, holotype (female): CAS, Type No. 11473; Misión San Borja, Baja California Norte, Mexico, 20–VI–1968, S. C. Williams, M. A. Cazier.

DISTRIBUTION.—Misión San Borja region.

REMARKS.—This species is distinctive within *Vaejovis* in having small denticles developed along the ventral margin of the movable finger of the chelicera. This character would associate the species with the genus *Paruroctonus*, however, it appears more similar to *Vaejovis rufulus*, *Vaejovis andreas*, *Vaejovis lindsayi*, and *Vaejovis minimus*. The small denticles on the chelicerae appear to have developed secondarily and do not appear as evidence of a relationship with *Paruroctonus*.

This species was originally named *Uroctonus cazieri* by Gertsch and Soleglad. In 1974, Stahnke placed it in the genus *Vaejovis*. In so doing a junior homonym was created because the name *Vaejovis cazieri* was already occupied by *Vaejovis cazieri* Williams, a species de-

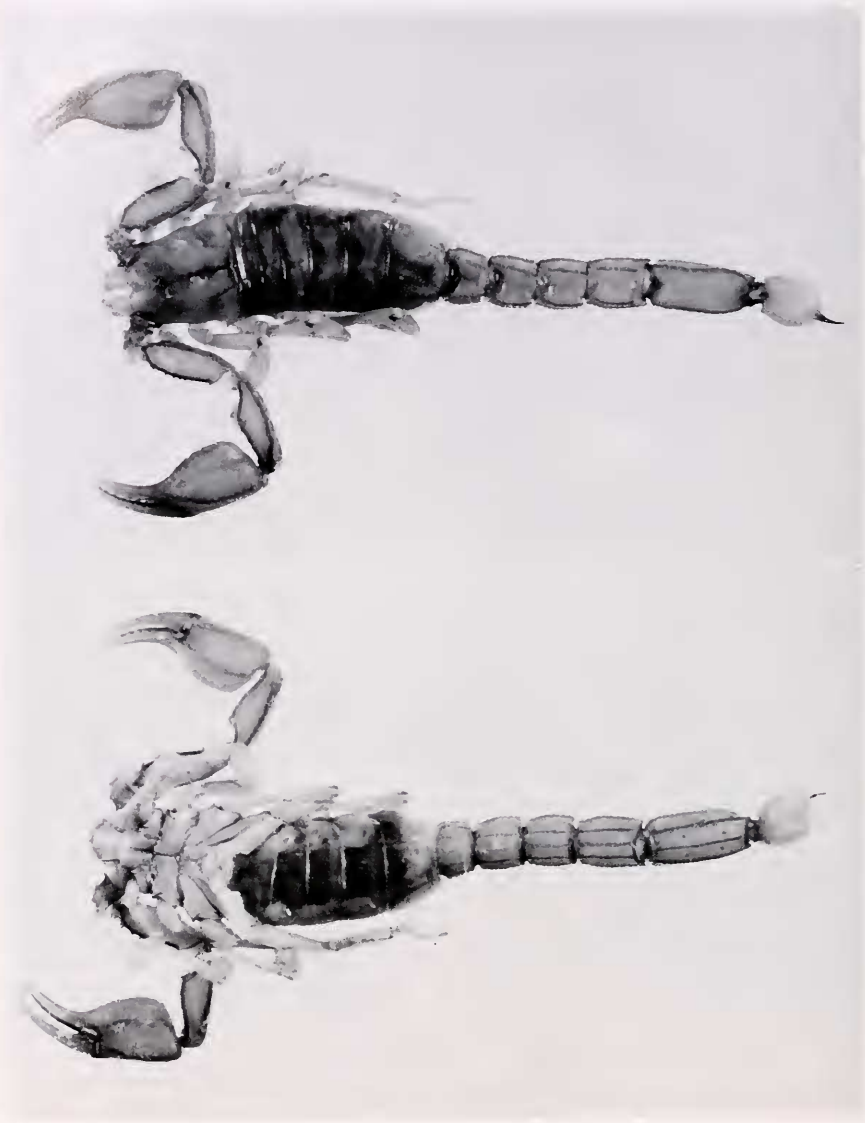

FIGURE 80. *Vaejovis montcazieri*, topotype, female, dorsal and ventral views.

scribed from Coahuila, Mexico (Williams 1968d:12–15). The name *Vaejovis montcazieri* is here proposed for replacement of the name *Vaejovis cazieri* (Gertsch and Soleglad).

Vaejovis rufulus (Gertsch and Soleglad)

(Figures 78, 81)

Uroctonus rufulus GERTSCH AND SOLEGLAD, 1972:568, 584–585.

DIAGNOSIS.—Adults to 30 mm long. Base color yellowish brown with faint dusky mottling on carapace and mesosomal dorsum. Pedipalp fingers short, palm swollen; ratio of movable-finger length to carapace length about 0.8–0.9; ratio of chela length to palm width 2.8–3.0; palm with ventral keel obsolete; supernumerary granules 6 on fixed finger, 7 on movable finger; fixed finger with trichobothrium *id* slightly distal to finger origin, trichobothrium *ip* above movable-finger articulation. Metasoma with segments I and II each wider than long, III with length approximating width, IV with ratio of length to width

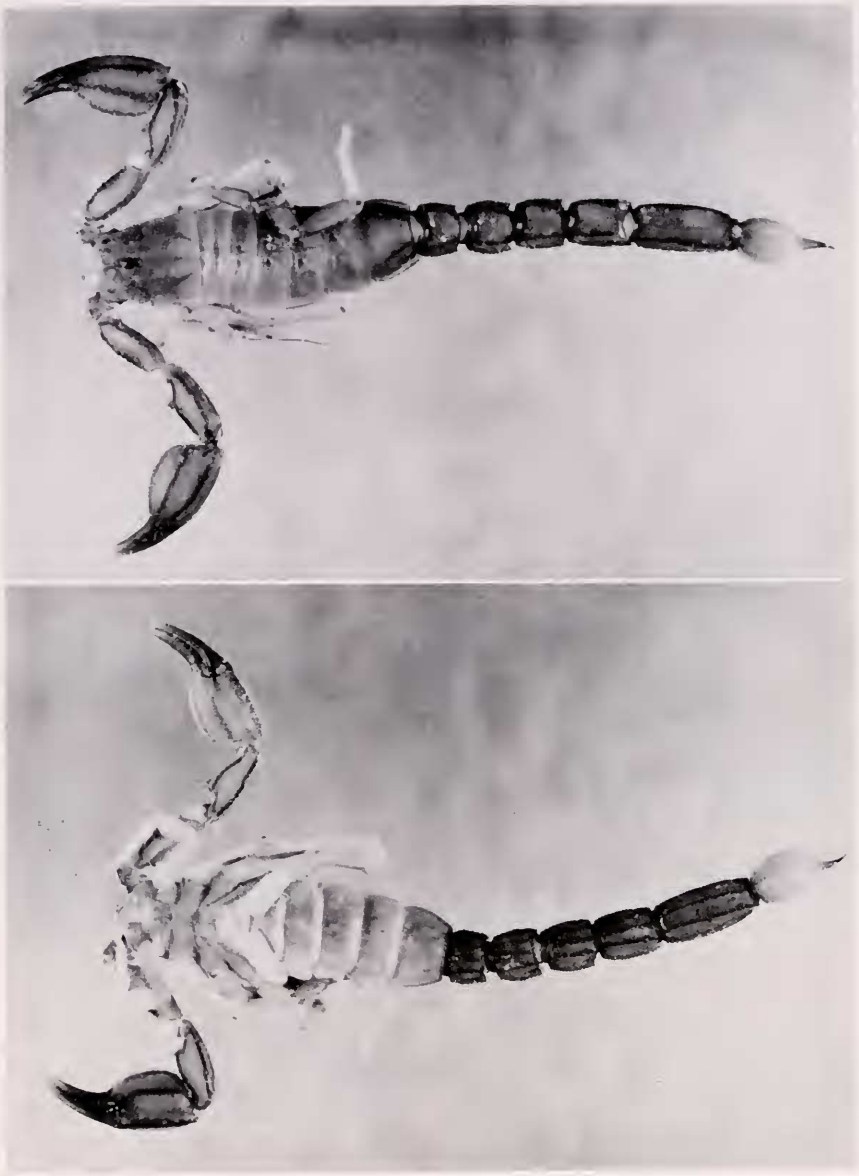

FIGURE 81. *Vaejovis rufulus*, topotype, male, dorsal and ventral views.

1.3–1.4; ventromedian and ventrolateral keels crenular. Pectine teeth 11–12 in males, 9–10 in females.

Similar to *V. lindsayi* but differs as follows: ventral keel of pedipalp palm distinctly developed, angular, granular (not rounded to obsolescent); trichobothrium *ip* of fixed pedipalp finger directly over movable-finger articulation (not slightly distal).

TYPE DATA.—*Uroctonus rufulus*, holotype (male): CAS, Type No. 11474; Punta Banda, Baja California Norte, Mexico, 4–IV–1969, S. C. Williams.

DISTRIBUTION.—Northwestern coastal region from Punta Banda south to Puerto Santo Tomás.

REMARKS.—Appears to prefer hard-packed sedimentary terrain. Most specimens have been collected under dead agave and rocks.

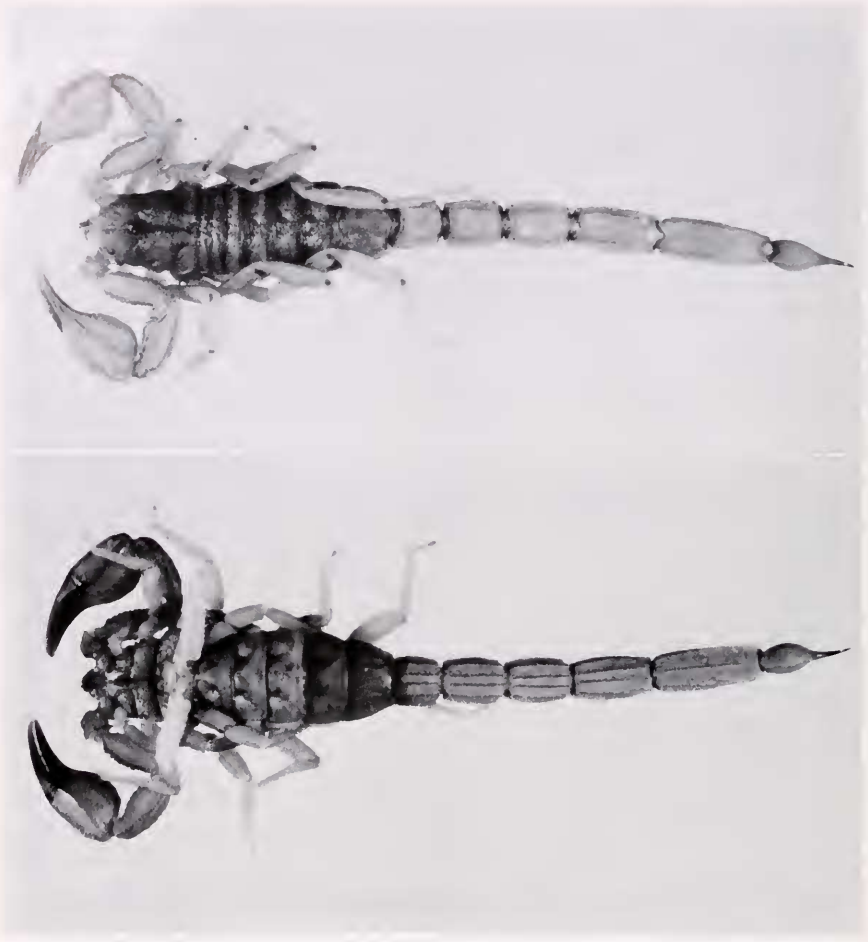

FIGURE 82. *Vaejovis bruneus bruneus*, topoparatype, male, dorsal and ventral views.

Genus **Vaejovis**: punctipalpi subgroup

The punctipalpi subgroup is distinguished from others as follows: pedipalp with short fingers and swollen palms, palms keeled, keels usually granular; ratio of chela length to width of palm 2.6–3.3; ratio of movable-finger length to palm width 1.5–1.9; supernumerary granules 6 on fixed finger, 7 on movable finger; primary-row denticles subdivided into subrows by slightly enlarged denticles. Metasoma with dorsal and dorsolateral keels strongly developed and serrate or crenulate on segments I–IV; ventrolateral keels strongly developed and crenulate on all segments; ventromedian keels developed, usually crenulate on segments II–IV; segment V longer than movable pedipalp finger. The following 5 Baja California species are members of the punctipalpi subgroup: *V. punctipalpi*, *V. bruneus*, *V. hirsuticauda*, *V. insularis*, and *V. magdalensis*.

Vaejovis bruneus Williams

Vejovis bruneus WILLIAMS, 1970b:317–322.

DIAGNOSIS.—Adults to 52 mm long. Base color uniform light brown, pedipalp with contrasting reddish-brown fingers. Pedipalp with palms swollen, ratio of chela length to palm width 2.5–3.3; ratio of movable-finger length to carapace length 0.7–0.9; palm with keels developed and granular; internal border of fingers not scalloped, no open space between fingers when chela closed; ratio of movable-finger length to palm width 1.4–1.8; supernumerary granules 6 on fixed finger, 7 on movable finger. Vesicle of tel-

son lacking abundant, long hairs on ventral surface. Metasoma with segment I as wide or wider than long, segment II longer than wide, ventrolateral and ventromedian keels well developed and crenular. Pectine teeth 15–19 in females, 17–21 in males.

Similar to *Vaejovis punctipalpi* and *Vaejovis insularis*. Differs from *V. punctipalpi* as follows: neither sex with scalloped pedipalp fingers nor open space between fingers when chela closed; aculeus not as elongate; cuticle and pedipalp fingers deeper brown. Differs from *V. insularis* as follows: vesicle of male and female not densely covered with long robust hairs, mature female without scalloped pedipalp fingers, and telson without vesicle as greatly reduced, aculeus not as greatly elongate.

Vaejovis bruneus is represented by three endemic subspecies: *V. b. bruneus*, *V. b. villosus*, and *V. b. loretoensis*.

Vaejovis bruneus bruneus Williams

(Figures 56*C*, 57*D*, 82, 83)

Vejovis bruneus Williams, 1970b:317–322.

Diagnosis.—Similar to *V. bruneus villosus* and *V. bruneus loretoensis*, but differs as follows: vesicle essentially bald or with short inconspicuous hairs that never approximate aculeus in length.

Type Data.—*Vejovis bruneus*, holotype (male), allotype: CAS, Type No. 10410; 8.0 km SW San Miguel Comondú, 2–VI–1968, S. C. Williams, M. A. Cazier.

Distribution.—San Ignacio south to El Crucero.

New Records.—**Baja California Sur, Mexico:** Misión San Ignacio, 21–25–I–1965 (Roth, AMNH); 23.7 km SW Loreto, 26–V–1970 (Williams, Lee); 6.4 km S Misión San Javier, 18–V–1969 (Williams); 82 km N El Crucero, 14–V–1969 (Williams).

Remarks.—Prefers predominantly rocky volcanic habitats where fine-textured soil has accumulated. Its dark coloration is an adaptation to dark volcanic habitats.

Vaejovis bruneus loretoensis Williams

(Figures 57*E*, 83, 84[*upper*])

Vaejovis bruneus loretoensis Williams, 1971b:54–57.

Diagnosis.—Similar to *Vaejovis bruneus bruneus* and *V. b. villosus*. Differs from *V. b. bruneus* as follows: pedipalp fingers not as darkly marked, more reddish than brown; aculeus slightly less elongate; telson vesicle with small patch of long hairs on ventral surface. Differs from *V. b. villosus* as follows: hairs on vesicle distinctly less abundant and usually limited to a small patch of long ventrally located hairs.

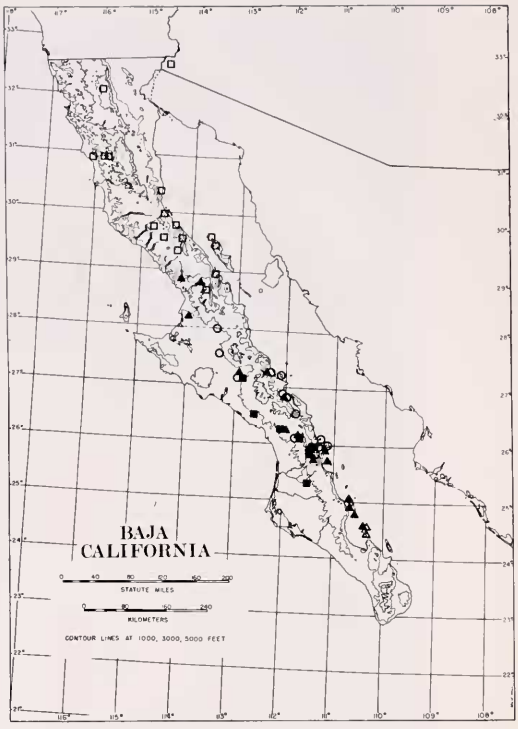

Figure 83. Distribution of *Vaejovis bruneus bruneus* (closed squares), *Vaejovis bruneus loretoensis* (circles), *Vaejovis bruneus villosus* (closed triangles), *Vaejovis hirsuticauda* (open squares), and *Vaejovis insularis* (open triangles).

Type Data.—*Vaejovis bruneus loretoensis*, holotype (male), allotype: CAS, Type No. 11466; San Ignacio, Baja California Sur, Mexico, 24–VI–1968, S. C. Williams, M. A. Cazier.

Distribution.—From 42 km south of El Arco to Loreto, and following islands: San Marcos, Coronados, Carmen.

New Records.—**Baja California Sur, Mexico:** SW end Isla San Marcos, 19–III–1971 (Lee); Isla de Carmen, Bahía Salinas, 24–III–1971 (Lee).

Vaejovis bruneus villosus Williams

(Figures 57*F*, 83, 84[*lower*])

Vaejovis bruneus villosus Williams, 1971b:51–54.

Diagnosis.—Similar to *V. bruneus bruneus* but differs as follows: abundant hairs on ventral

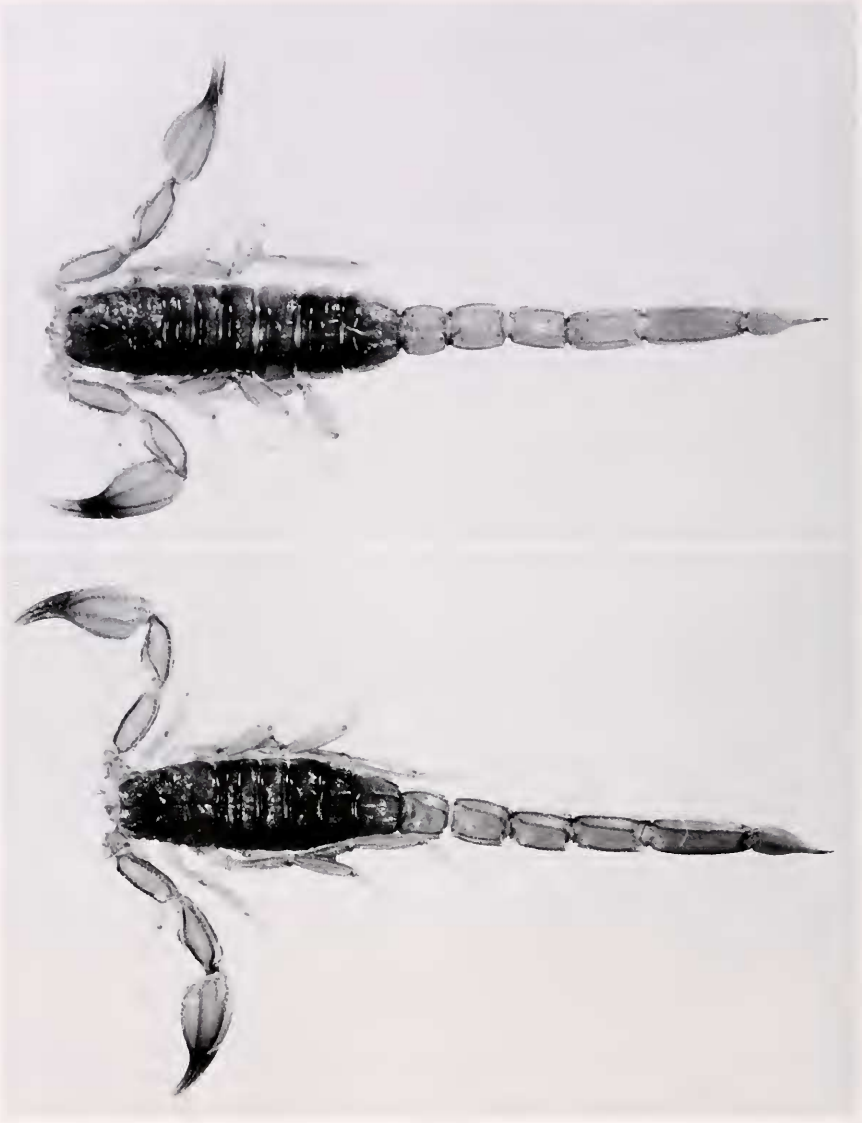

FIGURE 84. *Vaejovis bruneus loretoensis*, paratype, male, dorsal view (*upper*); *Vaejovis bruneus villosus*, paratype, male, dorsal view (*lower*).

side of telson vesicle approximating aculeus in length (not with vesicle essentially bald, or with inconspicuous hairs much shorter than aculeus). Distinguished from *V. bruneus loretoensis* as follows: ventral surface of vesicle abundantly covered with long hairs (not with small ventral patch of long hairs).

TYPE DATA.—*Vaejovis bruneus villosus*, holotype (male), allotype: CAS, Type No. 11467; 8.0–16.1 km SW San Miguel Comondú, Baja California Sur, Mexico, 3–VII–1968, S. C. Williams, M. A. Cazier.

DISTRIBUTION.—Misión San Borja south to Puerto Escondido, and following islands: Carmen, Monserrate, Danzante, San José, and San Francisco.

NEW RECORDS.—**Baja California Sur, Mexico:** 5.6 km NE San Isidro, 4–XII–1961 (Cary-Carnegie Expedition, CM); Isla Cayo, 10–II–1974 (Doyen, Cheng, Lewin).

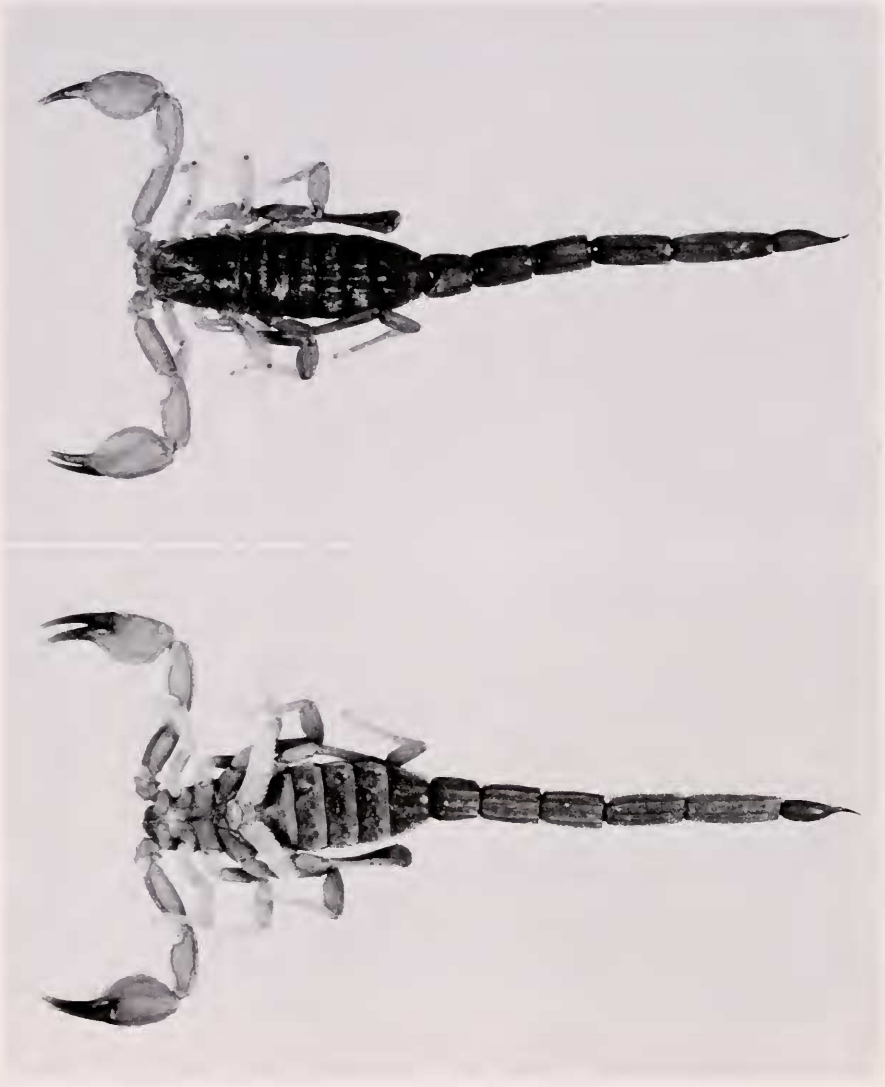

FIGURE 85. *Vaejovis hirsuticauda*, male, dorsal and ventral views.

Vaejovis hirsuticauda Banks

(Figures 56*D*, 83, 85)

Vejovis hirsuticauda BANKS, 1910:187, 189. GERTSCH AND ALLRED 1965:8. STAHNKE 1974a:135.

Vaejovis hirsuticauda Banks. EWING 1928:10.

DIAGNOSIS.—Adults to 32 mm long. Base color of body yellowish brown, pedipalp fingers contrastingly reddish compared to palm. Pedipalp with short fingers and swollen palms; ratio of movable-finger length to carapace length 0.7–0.8; ratio of chela length to palm width 2.8–3.1; ratio of movable-finger length to palm width 1.5–1.7; supernumerary granules 6 on fixed finger, 7 on movable finger; pedipalp fingers not scalloped, no space between fingers when chela closed. Metasoma with segment I distinctly longer than wide, segment V 3.2–3.3 times longer than wide. Pectine teeth 15–16 in females, 17–19 in males. Telson with short aculeus, vesicle oblate, abundant hairs on ventral side of telson, vesicle approximating aculeus in length or longer.

Similar to *V. bruneus villosus*, but differs as follows: metasomal segment I distinctly longer

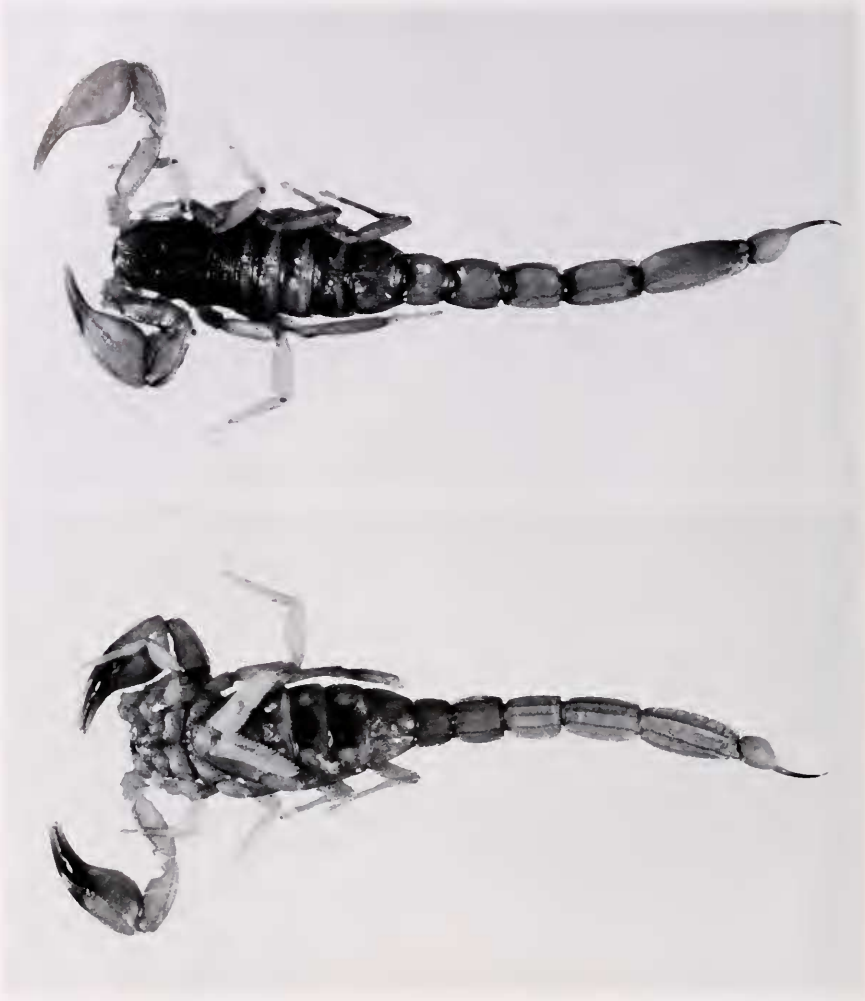

FIGURE 86. *Vaejovis insularis*, topoparatypes, male, dorsal and ventral views.

than wide; ratio of total metasoma length to width of metasomal segment V 11.0 or greater; vesicle more or less oblate from lateral view (not normally narrowed posteriorly).

TYPE DATA.—*Vejovis hirsuticauda*, "type" (female): MCZ; San Bernardino County, California.

DISTRIBUTION.—Baja California, from Colorado Desert and foothills of the Sierra San Pedro Mártir; California; Arizona; Nevada.

NEW RECORDS.—**Baja California Norte, Mexico:** Guadalupe Canyon, E side Sierra Juárez, 18–VI–1973 (Williams, Blair); 24 km W Meling Ranch, 13–VII–1969 (Williams, Lee); 24 km E San Telmo de Arriba, 13–VII–1969 (Williams, Lee); Jaraguay Summit, 1973 (CIS); Puertecitos, 11–VI–1968 (Williams, Cazier); 3.2 km NW Santa Ynez Ranch, 27–III–1973 (Doyen, CIS); 12.9 km N Laguna Chapala, 16–IV–1965 (Cavagnaro, Ross, Vesterby); 43 km S Puertecitos, 12–VI–1968 (Williams, Cazier); 1.6 km N Gonzaga Bay, 14–VI–1968 (Williams, Cazier); 11.3 km N Gonzaga Bay, 14–VI–1968 (Williams, Cazier); 0.8 km S La Virgen, 8–IV–1969 (Williams); Calamajué Arroyo, 16–VI–1968 (Williams, Cazier); Isla Méjia, E side, 19–IV–1962 (Campbell); Isla Ángel de la Guarda, 13–III–1971 (Lee); 4.0 km NW Bahía de los Ángeles, 19–VI–1968 (Williams, Cazier); 61 km NW Bahía de los Ángeles, 1–IV–1973 (Szerlip, CIS); 68 km SW Misión San Borja, 21–VI–1968 (Williams, Cazier).

Vaejovis insularis Williams

(Figures 56*E*, 83, 86)

Vejovis insularis WILLIAMS, 1970b:322–325.

DIAGNOSIS.—Adults to 49 mm long. Base color of cuticle uniform bright yellow, pedipalp fin-

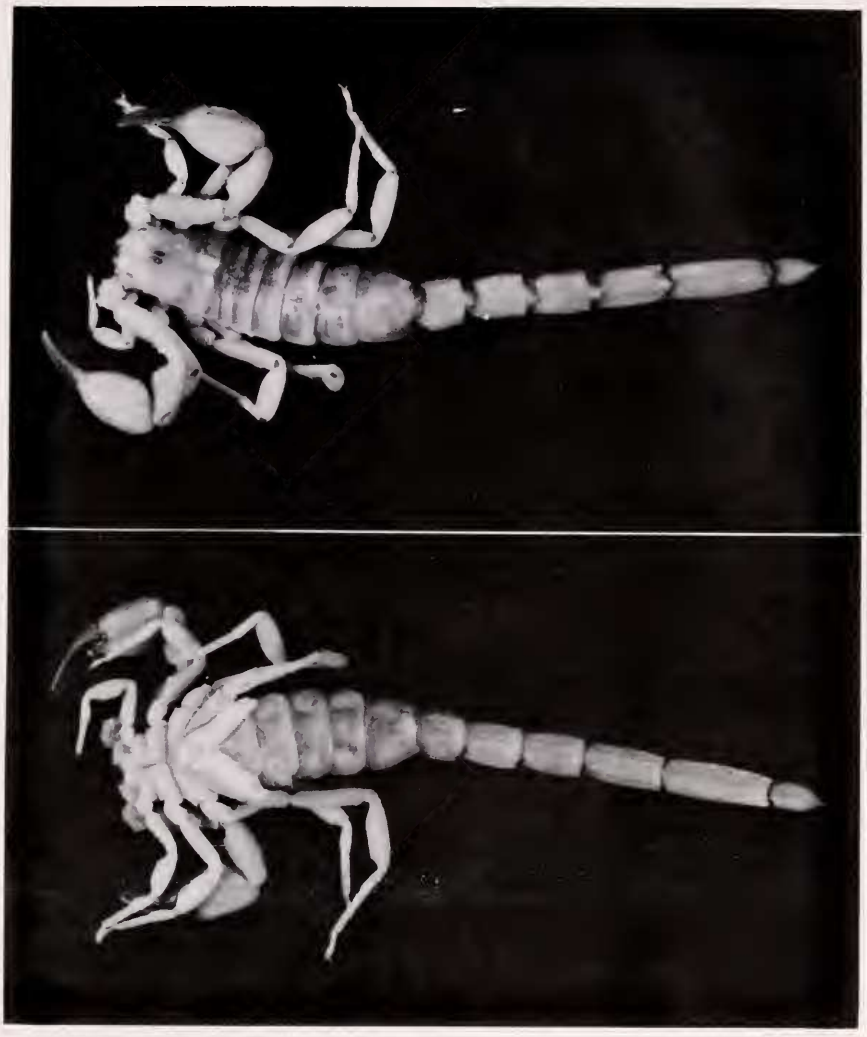

FIGURE 87. *Vaejovis magdalensis*, topoparatype, male, dorsal and ventral views.

gers dark reddish brown. Pedipalp with short fingers, palms swollen; ratio of movable-finger length to carapace length 0.8–0.9; ratio of chela length to palm width 2.9–3.2; ratio of movable-finger length to palm width 1.6–1.8; supernumerary granules 6 on fixed finger, 7 on movable finger; palm with keels well developed and granular; no scallop along fingers; no open space remaining between fingers when chela closed. Metasoma with ventromedian and ventrolateral keels well developed and finely serrate; metasomal segment I as wide or wider than long, segment II longer than wide, segment V 2.7–2.8 times longer than wide. Pectine teeth 18–19 in males, 16–17 in females. Telson with reduced vesicle and elongate aculeus; vesicle of both sexes densely covered with long conspicuous reddish hairs; ratio of vesicle length to aculeus length less than 1.5 in males.

Similar to *Vaejovis punctipalpi* but differs as follows: vesicle of telson more hirsute; no pedipalp scallop in either sex; no proximal space between fingers when chela closed.

TYPE DATA.—*Vejovis insularis*, holotype (male), allotype: CAS, Type No. 10422; Isla Partida, large central valley, Baja California Sur, Mexico, 10–VII–1968, S. C. Williams, M. M. Bentzien, W. K. Fox.

DISTRIBUTION.—Following islands: Partida, Espíritu Santo, and Las Ánimas.

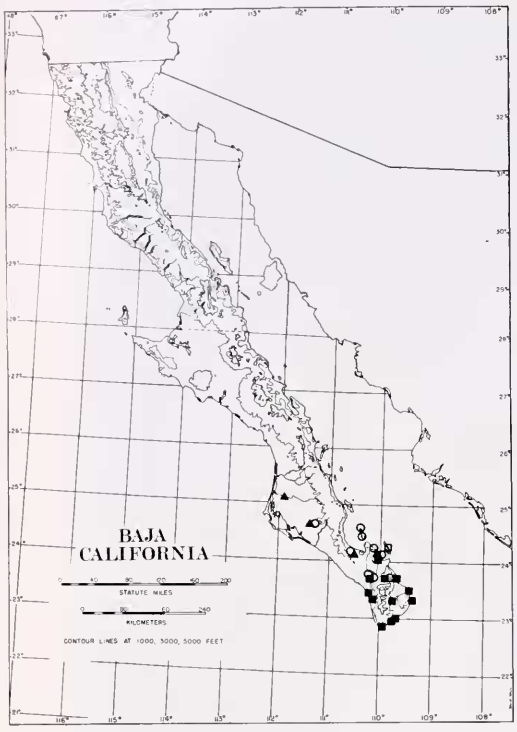

FIGURE 88. Distribution of *Vaejovis magdalensis* (closed triangles), *Vaejovis punctipalpi barbatus* (circles), *Vaejovis punctipalpi cerralvensis* (open squares), and *Vaejovis punctipalpi punctipalpi* (closed squares).

NEW RECORD.—**Baja California Sur, Mexico:** Isla Las Ánimas, 27–VI–1964 (Lindsay).

Vaejovis magdalensis Williams

(Figures 56*B*, 87, 88)

Vaejovis magdalensis WILLIAMS, 1971b:47–51.

DIAGNOSIS.—Adults to 43 mm long. Base color of body uniform pale, golden-yellow, pedipalp fingers light reddish. Pedipalp with swollen palm and short fingers; ratio of movable-finger length to carapace length 0.7–0.9; ratio of chela length to palm width 3.1–3.3; ratio of movable-finger length to palm width 3.0–3.3; supernumerary granules 6 on fixed finger, 7 on movable finger; fingers with subtle scallop, no distinct open space in proximal scallop when chela closed. Aculeus elongate but shorter than vesicle; ventral surface of vesicle smooth, not hirsute. Metasoma with segment I as wide as or wider than long, segment II distinctly longer than wide, segment V 2.7–2.8 times longer than wide; ventromedian keels smooth to crenulate on segments I–III, crenulate to serrate on segment IV. Pectine teeth 16–17 in females, 17–19 in males.

Similar to *V. punctipalpi* but differs as follows: pedipalp with subtly scalloped fingers, no space between fingers when chela closed (not with conspicuously scalloped fingers and distinct open space between fingers when chela closed); aculeus distinctly shorter than vesicle.

TYPE DATA.—*Vaejovis magdalensis*, holotype (male), allotype: CAS, Type No. 11468; 121 km NW La Paz, along road to El Crucero, Baja California Sur, Mexico, 4–VII–1968, S. C. Williams, M. A. Cazier.

DISTRIBUTION.—Magdalena Plain south to Los Aripes near La Paz.

Vaejovis punctipalpi (Wood)

Buthus punctipalpi WOOD, 1863a:109; 1863b:369–370. UNDERWOOD 1885:165.
Vejovis punctipalpis (Wood). MARX 1887:91.
Vejovis mexicanus (Wood) [part]. KRAEPELIN 1899:185.
Vejovis punctipalpi (Wood). BANKS 1900:424 [part]; 1910:189 [part]. HOFFMANN 1931:402. COMSTOCK 1940:31 [part]. STAHNKE 1974a:135.
Vaejovis punctipalpis (Wood) [part]. EWING 1928:10.
Vaejovis punctipalpus (Wood) [part]. EWING 1928:9–11.
Vejovis punctipalpus (Wood) [part]. GERTSCH 1958:9–11. GERTSCH AND SOLEGLAD 1966:1.
Vaejovis punctipalpi (Wood). WILLIAMS 1971b:40.

DIAGNOSIS.—Adults to 64 mm long. Base color more or less uniform golden-yellow, pedipalp fingers reddish. Metasoma with ventromedian keels of segments I and II essentially smooth but with a few posteriorly located crenulations, more crenulate than smooth on III, crenulate to serrate on IV; ventrolateral keels crenular on segments I–IV; metasoma at least 7.5 times longer than width of segment V; segment I width approximating length, segment II distinctly longer than wide, segment IV at least 1.5 times longer than wide. Pedipalp with swollen palms; ratio of movable-finger length to carapace length 0.8–0.9; ratio of chela length to palm width 2.8–3.1; ratio of movable-finger length to palm width 1.6–1.9; fingers of male and female with deep proximal scallop on both fingers; distinct space between fingers in proximal scallop when chela closed; supernumerary granules 6 on fixed finger, 7 on movable finger; aculeus as long as or longer than vesicle. Pectine teeth 17–20 in males, 16–18 in females.

Similar to *Vaejovis magdalensis* but differs as follows: pedipalp fingers more deeply scalloped,

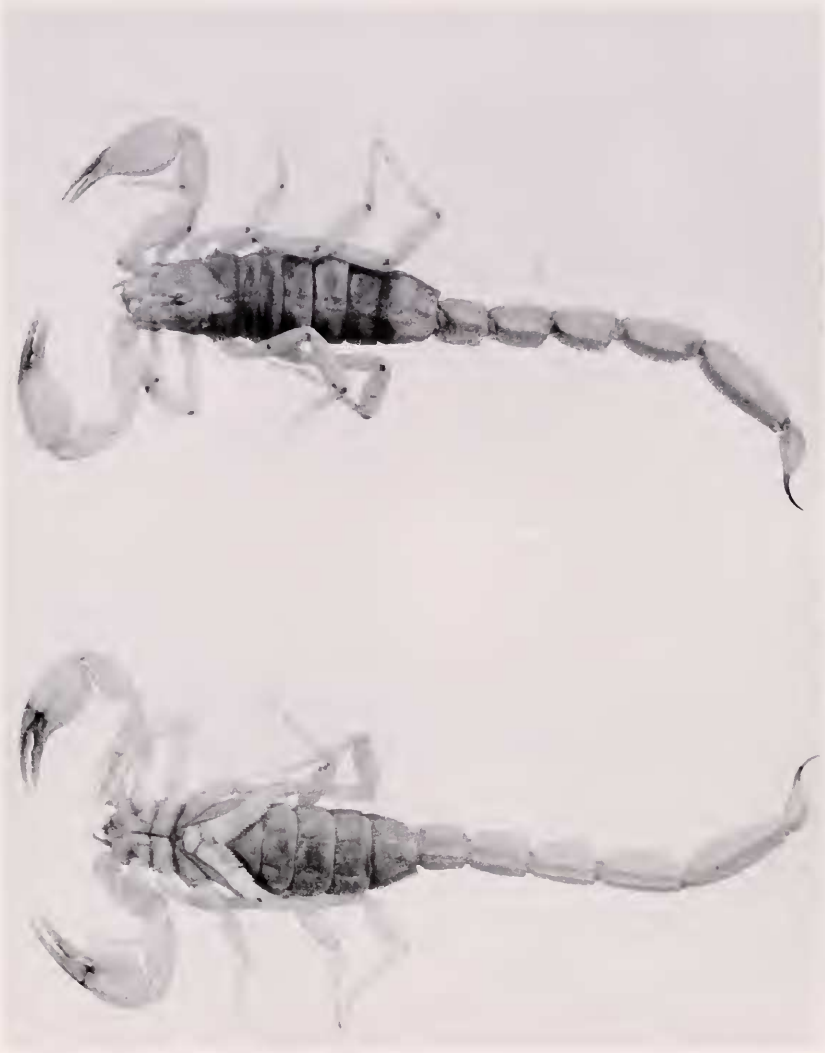

FIGURE 89. *Vaejovis punctipalpi punctipalpi*, topotype, male, dorsal and ventral views.

distinct space remaining between fingers when chela closed; aculeus more elongate, vesicle shallower; metasoma with ventromedian keels of segments I and II essentially smooth (not more crenulate than smooth).

REMARKS.—*Vaejovis punctipalpi* forms three allopatric subspecies in southern Baja California and associated islands. These are distinguished by the hirsuteness of the telson vesicle.

Vaejovis punctipalpi punctipalpi (Wood)

(Figures 51, 52, 53*L*, 56*A*, 57(*A*, *B*), 88, 89)

Buthus punctipalpi WOOD, 1863a:109; 1863b:369–370.

Vaejovis punctipalpi punctipalpi (Wood). WILLIAMS, 1971b: 40–44.

DIAGNOSIS.—Similar to *Vaejovis punctipalpi barbatus* and *Vaejovis punctipalpi cerralvensis*. Differs from *V. p. barbatus* as follows: vesicle of both male and female not conspicuously hirsute (vesicle of female conspicuously hirsute in *V. p. barbatus*). Differs from *V. p. cerralvensis* as follows: vesicle not conspicuously hirsute in either sex.

TYPE DATA.—*Buthus punctipalpi*, "type" (female): USNM, S-2 (Jar 1); "Cabo San Lucas" [Baja California Sur, Mexico], "J. Xantus de Vesey."

DISTRIBUTION.—Eight km southwest of La Paz south to Cabo San Lucas.

New Record.—**Baja California Sur, Mexico:** Punta Pulmo, 2–VII–1973 (Williams, Blair).

Remarks.—The type-specimen was compared with topotypes recently collected at Cabo San Lucas; they did not differ significantly in basic structure. Another scorpion, labeled S-3, Jar 1, is also labeled "type" in the U.S. National Museum collection. This specimen is, however, labeled "*Vejovis punctipalpis* Wood," indicating, by change in spelling, that it might have been "designated as type" sometime after the original description, or that the original data were rewritten and altered after the original description. This second specimen is not *V. punctipalpi* (as published by Wood), but is a related species. The only data on this specimen are "Cape San Lucas, Lower California." There is no indication that Xantus de Vesey (collector of the original series according to Wood's description) was collector of this specimen.

Vaejovis punctipalpi barbatus Williams

(Figures 57*C*, 88)

Vaejovis punctipalpi barbatus Williams, 1971b:45–47.

Diagnosis.—Similar to *Vaejovis punctipalpi punctipalpi* but differs as follows: females with ventral surface of vesicle conspicuously set with abundant, long, reddish hairs, males without apparent distinguishing characteristics (ventral surface of vesicle not conspicuously hirsute).

Type Data.—*Vaejovis punctipalpi barbatus*, holotype (female), allotype: CAS, Type No. 11469; Las Cruces, Baja California Sur, Mexico, 29–VII–1968, S. C. Williams, M. A. Cazier.

Distribution.—Magdalena Plain near Santa Rita south to San Bartolo, and following islands: Espíritu Santo, and Partida.

New Record.—**Baja California Sur, Mexico:** 16 km SE El Triunfo, 27–IV–1961 (Lindsay).

Vaejovis punctipalpi cerralvensis Williams

(Figure 88)

Vaejovis punctipalpi cerralvensis Williams, 1971b:47–48.

Diagnosis.—Similar to *Vaejovis punctipalpi punctipalpi* but differs as follows: ventral surface of vesicle conspicuously set with abundant, long, reddish hairs on both males and females.

Type Data.—*Vaejovis punctipalpi cerralvensis*, holotype (male), allotype: CAS, Type No. 11470; Isla Cerralvo, Bahía Limona, Baja California Sur, Mexico, 31–V–1969, S. C. Williams.

Distribution.—Isla Cerralvo.

Genus **Vaejovis**: wupatkiensis subgroup

The wupatkiensis subgroup is distinguished from others as follows: pedipalp with very elongate fingers, palm usually slender or only moderately swollen, movable and fixed fingers each terminate distally in elongate, clawlike denticle; fixed pedipalp finger with terminal-denticle length approximating finger depth at first supernumerary granule (terminal-denticle length no less than ¾ depth of finger); fixed pedipalp finger with terminal denticle at least five times longer than first supernumerary granule.

The following 15 Baja California species are members of the wupatkiensis subgroup: *V. baueri*, *V. gertschi*, *V. harbisoni*, *V. minutis*, *V. armadentis*, *V. haradoni*, *V. bechteli*, *V. gigantaensis*, *V. littoralis*, *V. pacificus*, *V. peninsularis*, *V. adcocki*, *V. janssi*, *V. hearnei*, and *V. dwyeri*.

Remarks.—Stahnke (1974) erected a new genus, *Serradigitus*, within which he placed several members of the wupatkiensis subgroup. Some species of the wupatkiensis subgroup, however, appear intermediate with the "eusthenura" or "minimus" subgroups of *Vaejovis*. Because of these links, it is impossible to clearly define "*Serradigitus*" as a distinct genus. For example, one of the major distinguishing characters of *Serradigitus* is that the pedipalp tarsus (movable finger) has a continuous row of conspicuously serrate, subequal denticles (primary-row denticles) uninterrupted, or indefinitely so, by larger denticles (enlarged denticles of primary row). The primary-row denticles do form a continuous row and are conspicuously serrate in most wupatkiensis-subgroup species, but this is not incompatible with placement in *Vaejovis*. Much variability exists within the wupatkiensis subgroup in the number of enlarged primary-row denticles and in the number of resulting subrows defined by them. Little significant difference was found between the dentition patterns of the movable and fixed fingers for any given species. On the pedipalp fixed finger the following variations in numbers of subrows of primary denticles were found: 2 subrows (*V. gertschi*, *V. haradoni*, and *V. harbisoni*); 2–3 subrows (*V. armadentis* and *V. hearnei*); 3 subrows (*V. gigantaensis* and *V. minutis*); 3–4 subrows (*V. pacificus*); 4 subrows (*V. bechteli* and *V. baueri*); 5 subrows (*V. littoralis*); 6 subrows (*V. peninsularis* and *V. janssi*). By contrast, most mem-

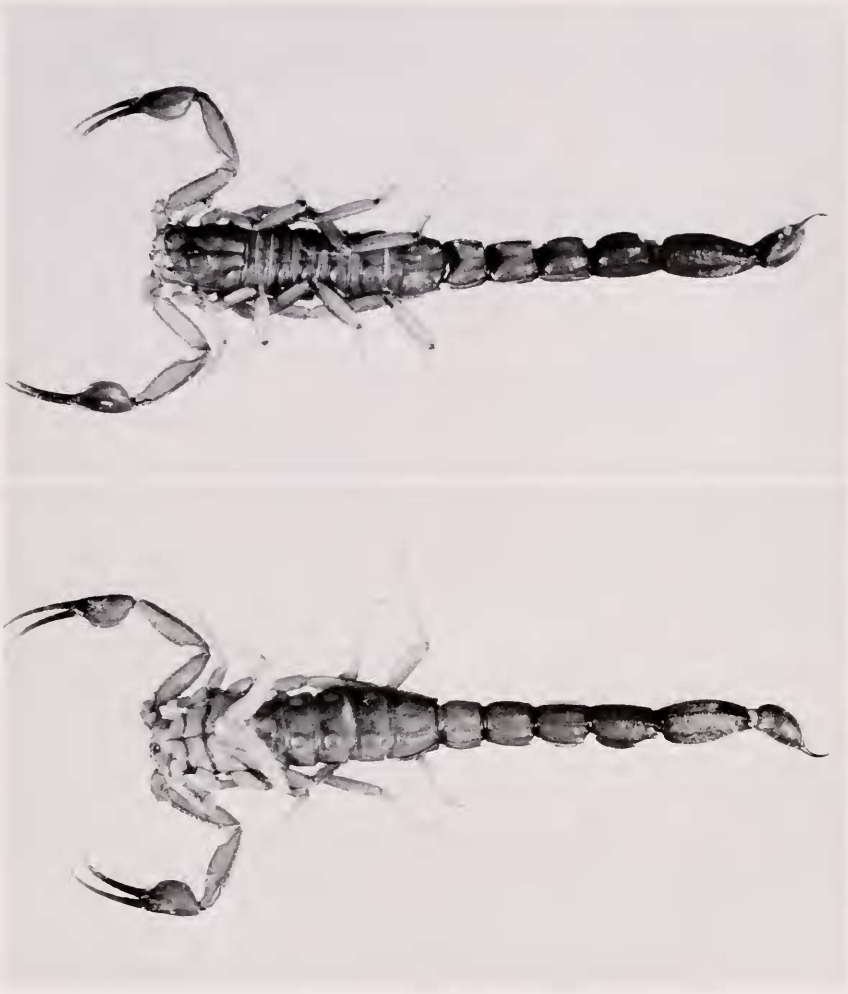

FIGURE 90. *Vaejovis adcocki*, holotype, male, dorsal and ventral views.

bers of the "punctipalpi" and "eusthenura" subgroup of *Vaejovis* have the primary-row denticles subdivided into 5 subrows by 4 slightly enlarged denticles (*V. puritanus* and *V. viscainensis*), or subdivided into 6 subrows by 5 slightly enlarged denticles (*V. confusus* and *V. waeringi*). It, therefore, appears that the reduced number of primary-denticle subrows in the "wupatkiensis subgroup" is an extreme expression of a basic pattern characteristic of *Vaejovis*.

Another character used to define *Serradigitus* is the presence on the pedipalp chela of a "terminal denticle which is abnormally large and clawlike and bears on its terminus an elongate whitish cap." Within the wupatkiensis subgroup, the terminal denticle does tend to be clawlike and elongate (Fig. 53*A–K*) and characteristically bears a whitish cap, but the degree of elongation varies within the subgroup. All species here considered members of the wupatkiensis subgroup do have this terminal denticle conspicuously elongate; but some members of the eusthenura subgroup have this terminal denticle in an intermediate state of elongation (i.e., *V. waeringi*, *V. viscainensis*, and *V. vorhiesi*) (Fig. 53*O–Q*).

Another character used to define *Serradigitus* is, "inferior lateral, large flanking denticles" (supernumerary granules) "vary in position and number from 6 to 16." Almost all species of *Vaejovis* have 6 supernumerary granules on the

FIGURE 91. Distribution of *Vaejovis adcocki* (circles), *Vaejovis bechteli* (open squares), *Vaejovis dwyeri* (triangles), and *Vaejovis haradoni* (closed squares).

fixed finger and 7 supernumerary granules on the movable finger. The exceptions are three species in the wupatkiensis subgroup (*V. harbisoni*, *V. deserticola*, and *V. subtilimanus*) which have more supernumerary granules. These three species each have variable numbers of supernumerary granules, even among specimens taken from the same locality.

Another character used to define *Serradigitus* is "female pectines with teeth number 1 through 3 more paddle-like and somewhat larger than others." Most of the species in the wupatkiensis subgroup have female pectine teeth much like those of the eusthenura subgroup. Some taxa such as *Vaejovis gertschi gertschi* have female pectines with one enlarged paddlelike basal pectine tooth. *Vaejovis gertschi striatus*, on the other hand, has female pectines with two enlarged paddlelike basal teeth. The enlargement of the basal pectine teeth on females is a good species or subspecies character, but not a reliable generic character.

Stahnke also used the numbers of pedipalp trichobothria and their relative position to define *Serradigitus*. The difference in numbers of trichobothria was found to be slight, and the particular trichobothrial groups that showed a difference in counts would be expected to vary. The relative position of select trichobothria used to distinguish *Serradigitus* would be expected to change somewhat with pedipalp chela elongation (which is variable within the subgroups of *Vaejovis*).

Analysis of the characters used to distinguish *Serradigitus* indicates they are not unique, but represent a more or less extreme expression of *Vaejovis* characters. Therefore, *Serradigitus* is here considered a junior synonym of *Vaejovis*.

Vaejovis adcocki Williams, new species
(Figures 53*K*, 90, 91; Tables 1, 2)

DIAGNOSIS.—Adults to 40 mm long. Base color of body deep yellowish brown. Pedipalp with long slender fingers; ratio of movable-finger length to carapace length 0.9–1.1; ratio of chela length to palm width 4.0–5.6; ratio of movable-finger length to palm width 2.8–3.7; supernumerary granules 6 on fixed finger, 7 on movable finger; primary-row denticles 34–54 on fixed finger. Metasoma with segment I wider than long, segment III as long as or slightly longer than wide, segment V with ratio of length to width 1.8–2.1; ratio of total metasomal length to width of segment V 6.0–6.8. Pectine teeth 21–25 in males, 19–24 in females.

Similar to *V. harbisoni*, *V. gertschi*, and *V. peninsularis*. Differs from *V. harbisoni* as follows: 6 supernumerary granules on pedipalp fixed finger (not with about 11–15 such granules). Differs from *V. gertschi* as follows: metasomal segment III with ventromedian and ventrolateral keels smooth (not crenulate); pectine teeth more than 20 in males, more than 18 in females. Differs from *V. peninsularis* as follows: pedipalp fixed finger with about 34–54 primary-row denticles (not about 75–80 such denticles), these not subdivided into 6 subrows by 5 slightly enlarged denticles.

DESCRIPTION OF HOLOTYPE.—**Male.** Coloration: base color of body deep yellowish brown, metasomal segment V slightly darker than others, carapace and mesosomal dorsum with obsolete dusky markings, pedipalp fingers contrastingly darker than palm. Carapace anterior margin with distinct median notch, this border with three pairs short hairs; entire carapace sur-

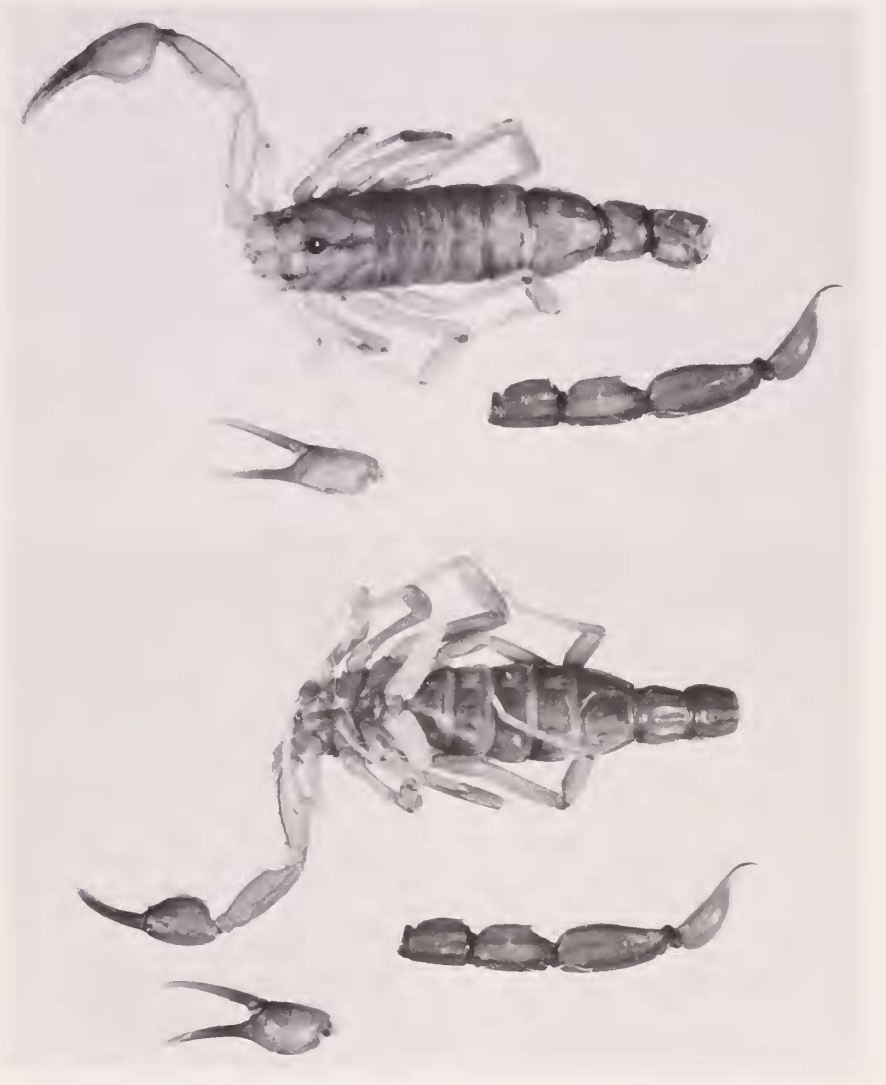

FIGURE 92. *Vaejovis armadentis*, holotype, male, dorsal and ventral views.

face densely granular. Mesosomal terga granular, tergum 7 with two pairs, serrate lateral keels and one short granular median keel; sterna smooth, lustrous; last sternum with one pair crenular lateral keels. Metasomal ventrolateral keels smooth to crenulate on segments I to IV; ventromedian keels smooth to obsolete on segments I to IV. Telson with ventral surface of vesicle smooth to subtly granular, with about 20 inconspicuous hairs; broad subaculear tubercule. Pedipalp chela long and slender, fingers elongate; palm short, moderately swollen; dorsal keels obsolete; fingers unscalloped, each finger terminates distally in an elongate tooth; fixed finger with 49 primary-row denticles, these subtly subdivided into two or three subrows by slightly enlarged denticles; supernumerary granules 6 on fixed finger, 7 on movable finger.

ALLOTYPE.—**Female.** Similar to holotype in structure and color with following exceptions: metasomal segment II wider than long; pectine shorter, smaller teeth; dorsum of mesosoma not as coarsely granular.

TYPE DATA AND ETYMOLOGY.—*Vaejovis ad-*

FIGURE 93. Distribution of *Vaejovis armadentis* (triangles), *Vaejovis baueri* (open circles), *Vaejovis littoralis* (closed circles), and *Vaejovis pacificus* (squares).

cocki, holotype (male), allotype: CAS, Type No. 12112; Isla Cerralvo, Bahía Limona, Baja California Sur, Mexico, 31–V–1969, S. C. Williams.

Named after Richard Adcock, sponsor of research trips to islands in Gulf of California.

DISTRIBUTION.—Loreto region and following islands: Coronados, Danzante, Monserrate, San José, San Francisco, Cerralvo.

RECORDS.—Paratypes studied from the following localities in **Baja California Sur, Mexico:** 27.4 km S Loreto, Puerto Escondido, 27–V–1970 (Williams, Lee); Isla Coronados, 3–IV–1962 (Harbison, SDMNH); Isla Danzante, NW side, 23–V–1970 (Williams, Lee); Isla Danzante, 7–IV–1962 (Belvedere Expedition); Isla Monserrate, NE side, 22–V–1970 (Williams, Lee); Isla San José, Bahía Amortajada, Salinas, 25–III–1971 (Lee); Isla San Francisco, SE side, 17–IV–1962 (Parrish); Isla Cerralvo, Bahía Limona, 31–V–1969 (Williams); Arroyo Aguaje, Isla Cerralvo, 15–IV–1962 (Hunsacker and Bostic); Isla Cerralvo, Piedras Gordas, 17–V–1970 (Williams, Lee).

Vaejovis armadentis Williams, new species

(Figures 54*H*, 55*E*, 92, 93; Table 1)

DIAGNOSIS.—Adults to 30 mm long. Base color of cuticle golden-brown with faint underlying dusky markings. Pedipalp with swollen palm; ratio of movable-finger length to carapace length 0.8–0.9; ratio of chela length to palm width 3.4–3.5; ratio of movable-finger length to palm width 1.8–1.9; fingers each terminate in elongate toothlike denticle; fixed finger with about 43 primary-row denticles, these subdivided into two subrows by a slightly enlarged denticle. Metasoma with segment I wider than long, segment II width approximating length, segment III longer than wide; ventromedian keels well developed and crenular on segments I–IV; ventrolateral keels well developed and crenular on segments I–IV. Pectine teeth 17 in males.

Similar to *Vaejovis gertschi* but differs as follows: palm more swollen, ratio of movable-finger length to palm width 2.0 or less (not 2.6–3.3); ratio of palm width to brachium width 1.3 or more (not 1.0–1.2); ratio of chela length to palm width less than 4.0.

DESCRIPTION OF HOLOTYPE.—**Male.** Coloration: base color of cuticle golden-brown; faint irregular traces of underlying markings on carapace, mesosomal terga, metasoma, and appendages; pedipalp fingers similar to palm in coloration; pectine whitish; region of ventromedian and ventrolateral keels of metasoma with faint dusky underlining. Carapace frontal margin with deep median emargination, appearing more or less bilobed; 3 pairs lateral ocelli; carapace surface densely granular. Metasoma with dorsolateral keels uniformly crenulate on segments I–IV, dorsolateral keels irregularly crenulate on V; ventrolateral keels strongly developed, irregularly crenular on segments I–IV, uniformly crenular on V; ventromedian keels well developed, irregularly crenulate on I–IV, uniformly crenulate on V. Telson with vesicle smooth, finely hirsute, ventral surface with about 20 long setae; subaculear tubercule small, broad. Pedipalp with fingers terminating distally in elongate toothlike denticle; fixed finger with primary-row denticles more or less subdivided into two subrows by a slightly enlarged denticle; fingers contact at distal terminations when chela closed forming elongate space between fingers proximally; fixed finger with trichobothrium *id* midway between supernumerary granule 5 and 6, trichobothrium *ip* slightly proximal to supernumerary granule 6, trichobothrium *db* midway between supernumerary granule 6 and fixed finger origin; palm with keels lowly developed, smooth laterally and dorsally, with irregular crenulations medially.

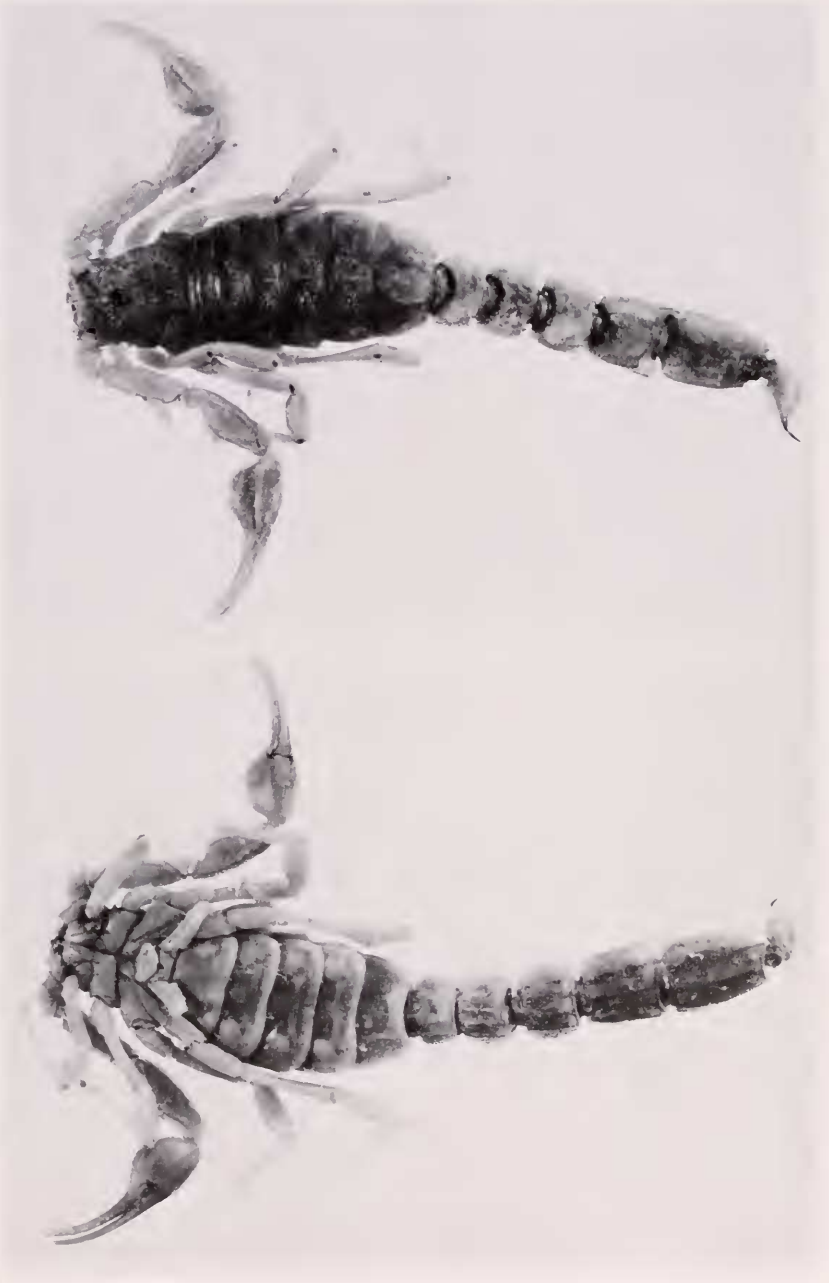

FIGURE 94. *Vaejovis baueri*, topotype, female, dorsal and ventral views.

TYPE DATA.—*Vaejovis armadentis*, holotype (male): CAS, Type No. 12113; SW side Isla Santa Cruz, Golfo de California, Baja California Sur, Mexico, 18–IV–1962, G. E. Lindsay.

DISTRIBUTION.—Santa Catalina and Santa Cruz Islands.

RECORDS.—Paratypes studied from **Baja California Sur, Mexico:** Isla Santa Catalina, 9–IV–1962 (Harbison, SDMNH).

Vaejovis baueri Gertsch

(Figures 53*E*, 93, 94)

Vejovis baueri GERTSCH, 1958: 6–9.

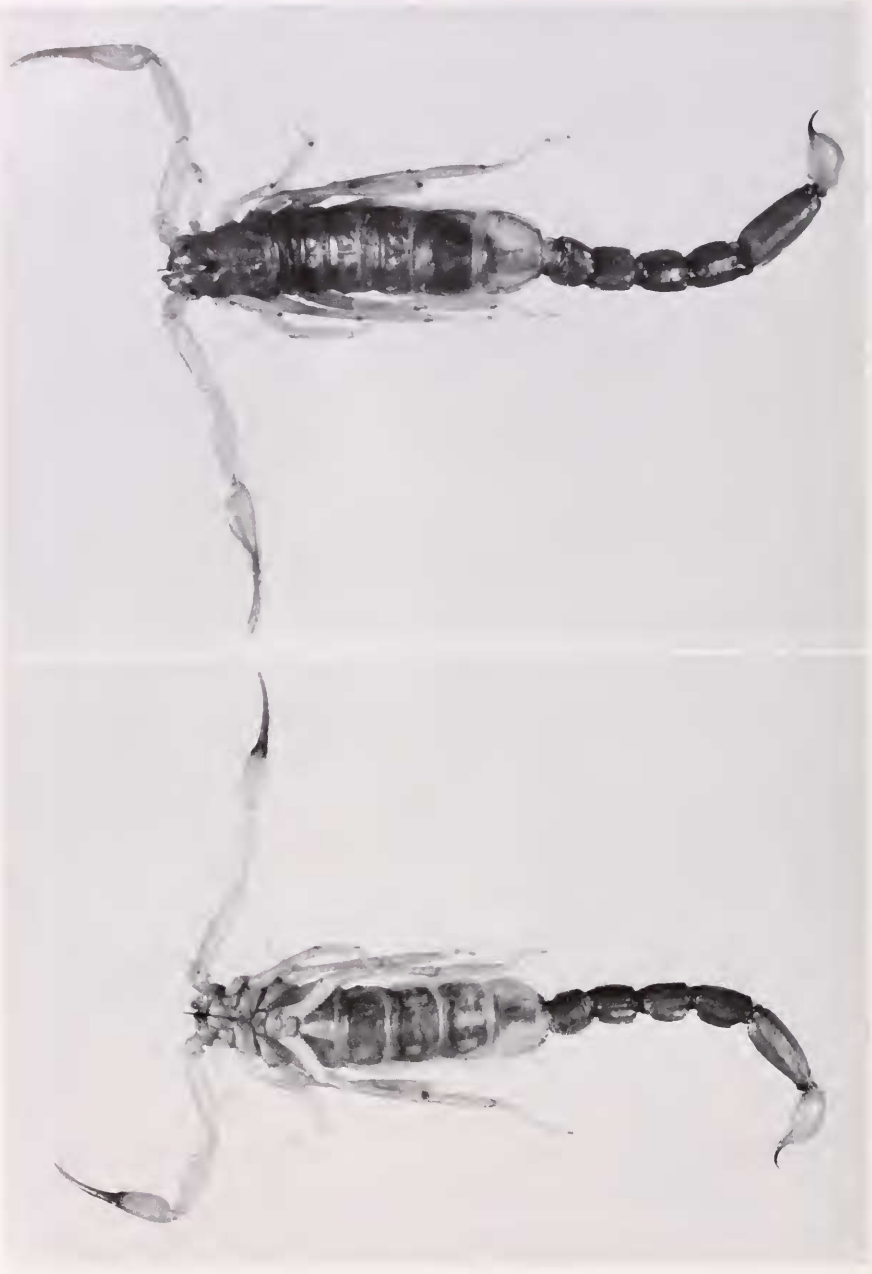

FIGURE 95. *Vaejovis bechteli*, holotype, female, dorsal and ventral views.

DIAGNOSIS.—Adults to 33 mm long. Base color of cuticle golden-yellow with underlying dusky markings; one pair more or less distinct longitudinal stripes on mesosomal dorsum. Pedipalp fixed finger with primary-row denticles consisting of 35–45 denticles; ratio of chela length to palm width less than 4.1. Metasoma robust, segment IV wider than long and terminating in winglike lateral expansion; metasoma with all ventromedian and ventrolateral keels well developed and crenulate; pectine teeth 14–15 in males, 13–15 in females.

Similar to *Vaejovis mininus thompsoni* and *V. pacificus*. Differs from *V. pacificus* as follows: ratio of metasoma length to width of fifth metasomal segment less than 5.0; ratio of brachium length to width less than 2.9; ratio of chela length to palm width less than 4.0; metasomal segment IV as wide as or wider than long. Distinguished from *V. m. thompsoni* as follows: pectine teeth 13–15 in males and females (not with 10–11 teeth); pedipalp with ratio of movable-finger length to palm width greater than 2.0; pedipalp with ratio of chela length to palm width greater than 3.3.

TYPE DATA.—*Vejovis baueri*, holotype (male), allotype: AMNH; West San Benito Island, Baja California Norte, Mexico, 9–III–1957, R. Zweifel.

DISTRIBUTION.—San Benito Island.

Vaejovis bechteli Williams, new species
(Figures 54*D*, 91, 95; Table 1)

DIAGNOSIS.—Adults to 33 mm long. Base color light yellow. Pedipalp chela very slender; ratio of movable-finger length to palm width 3.0 or greater; ratio of movable-finger length to carapace length 1.0–1.1; ratio of chela length to palm width 4.9–5.0; fixed finger with about 45–50 denticles in primary row, these more or less subdivided into 3 subrows by two slightly enlarged denticles. Metasoma segment I wider than long, segment II length approximating width, segment III longer than wide, segment V narrower than telson vesicle; pectine with about 15 teeth in females.

Similar to *Vaejovis gertschi* and *Vaejovis hearnei*. Differs from *V. gertschi* as follows: smooth ventromedian and ventrolateral metasomal keels (not distinctly crenulate); ratio of movable-finger length to length of metasomal segment I 2.1 or greater; palm with dorsal, lateral, and median keels smooth to obsolete (not developed and granular); vesicle wider than metasomal segment V. Differs from *V. hearnei* as follows: metasoma more slender, segment II as long as wide (not distinctly wider than long), segment III longer than wide (not wider than long); segment V at least two times longer than wide; brachium with ratio of length to width 3.4 or greater.

DESCRIPTION OF HOLOTYPE.—**Female.** Coloration: base color of cuticle light yellow; pedipalp fingers similar to palm in color, but slightly more reddish yellow. Carapace with frontal margin slightly emarginate; 3 pairs lateral ocelli; carapace surface moderately granular. Metasoma with dorsal and dorsolateral keels distinctly developed and irregularly crenulate on segments I–IV; ventrolateral keels essentially smooth, but with some irregular, reduced crenulation on segments I–IV, segment V crenulate, crenulation low, rounded, more or less uniform; ventromedian keels smooth, but somewhat irregular on segments I–IV, segment V smooth to crenulate. Telson with vesicle smooth and lustrous. Pedipalps with long fingers and slender palms; fingers terminate distally in enlarged toothlike denticle; trichobothrium *id* slightly anterior to supernumerary granule 6, trichobothrium *ip* slightly posterior to supernumerary granule 6, trichobothrium *db* midway between supernumerary granule 6 and fixed-finger origin; fingers meet only at distal termination when chela closed, elongate space between fingers when chela closed; palm with keels smooth to obsolete laterally and dorsally.

TYPE DATA AND ETYMOLOGY.—*Vaejovis bechteli*, holotype (female): CAS, Type No. 12114; Isla Las Ánimas, Baja California Sur, Mexico, 27–VI–1964, C. Parrish.

Named for Kenneth Bechtel, sponsor of research in Baja California.

DISTRIBUTION.—Las Ánimas and San José islands.

RECORDS.—**Baja California Sur, Mexico:** Isla San José, S end, 26–III–1971 (Lee) (paratypes).

Vaejovis dwyeri Williams, new species
(Figures 91, 96; Table 1)

DIAGNOSIS.—Adults to 22 mm long. Base color golden-yellow. Metasoma slender, ratio of total metasomal length to width of segment V greater than 8.0, segment II distinctly longer than wide, segment V length-to-width ratio 2.5–2.8; metasoma with ventromedian keels of segments I and II obsolete. Pedipalp fixed finger with fewer than 54 primary-row denticles, these subdivided into two subrows by slightly enlarged denticle; ratio of movable-finger length to carapace length about 1.0; ratio of chela length to palm width about 4.0; ratio of movable-finger length to palm width about 2.3–2.4. Pectine teeth 17–18 in males.

Similar to *Vaejovis gertschi*, *Vaejovis hear-*

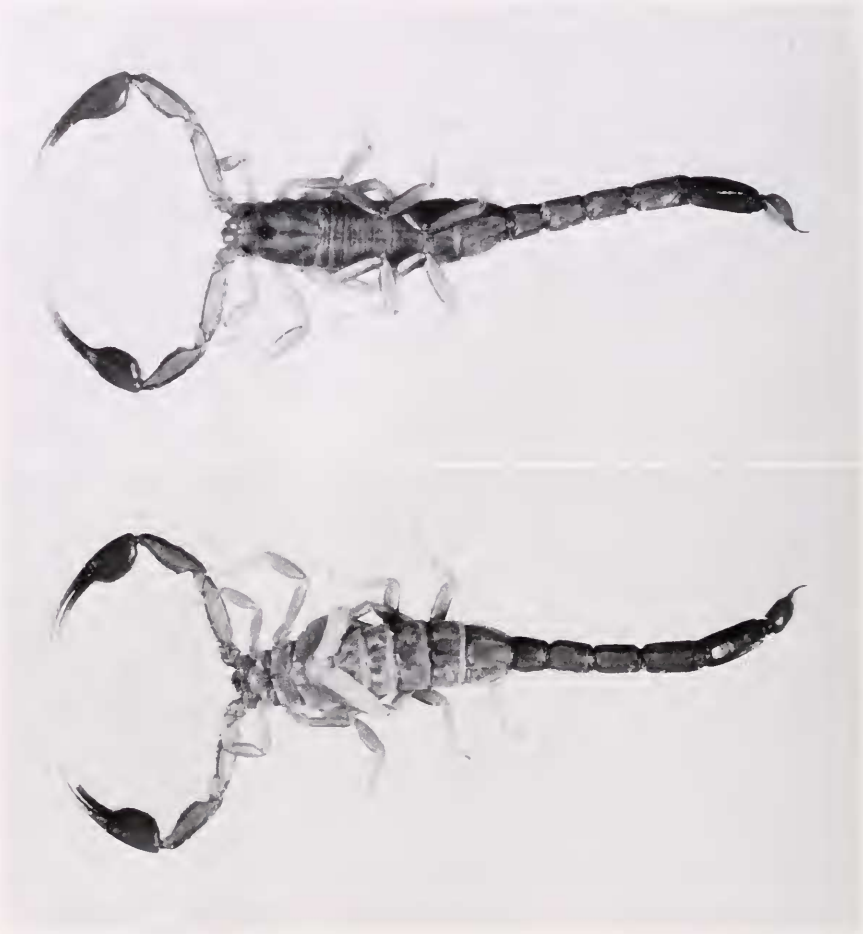

FIGURE 96. *Vaejovis dwyeri*, holotype, male, dorsal and ventral views.

nei, *Vaejovis pacificus*, and *Vaejovis bechteli*, but differs as follows: distinctively more slender metasoma which is 8.0 or more times longer than the width of metasomal segment V.

DESCRIPTION OF HOLOTYPE.—**Male.** Coloration: base color of cuticle golden-yellow; carapace, anterior mesosomal terga, and metasomal segment V with faint underlying dusky markings; pedipalp fingers similar to palm in color. Carapace frontal margin broadly truncate, three pairs lateral ocelli. Mesosoma tergum 7 with obsolete median keel and two pairs granular lateral keels; sternum of segment 7 with one pair smooth lateral keels. Metasoma ventrolateral keels of segments I–IV smooth with some very faint, irregular crenulation, crenulate on V; ventromedian keels obsolete on segments I–III, smooth to obsolete on IV, smooth to irregularly crenulate on V; length-to-width ratios on segments I–V 1.0, 1.3, 1.5, 1.8, 2.6, respectively; ratio of metasomal segment V length to length of metasomal segment I 2.4; dorsolateral keels crenular on segment I, smooth to crenular on II and III, smooth on IV; dorsal keels crenular on segments I–IV. Telson with vesicle smooth, lustrous; ventral surface of vesicle conspicuously hirsute, set with approximately 20 pairs long setae approximating aculeus in length; small, broad, subaculear tubercule. Pedipalp palm with keels broad, reduced and more or less smooth on dorsal and lateral surfaces, keels more granular on medial surfaces; fixed finger with primary denticles subdivided into two subrows by a slightly enlarged denticle; each finger termi-

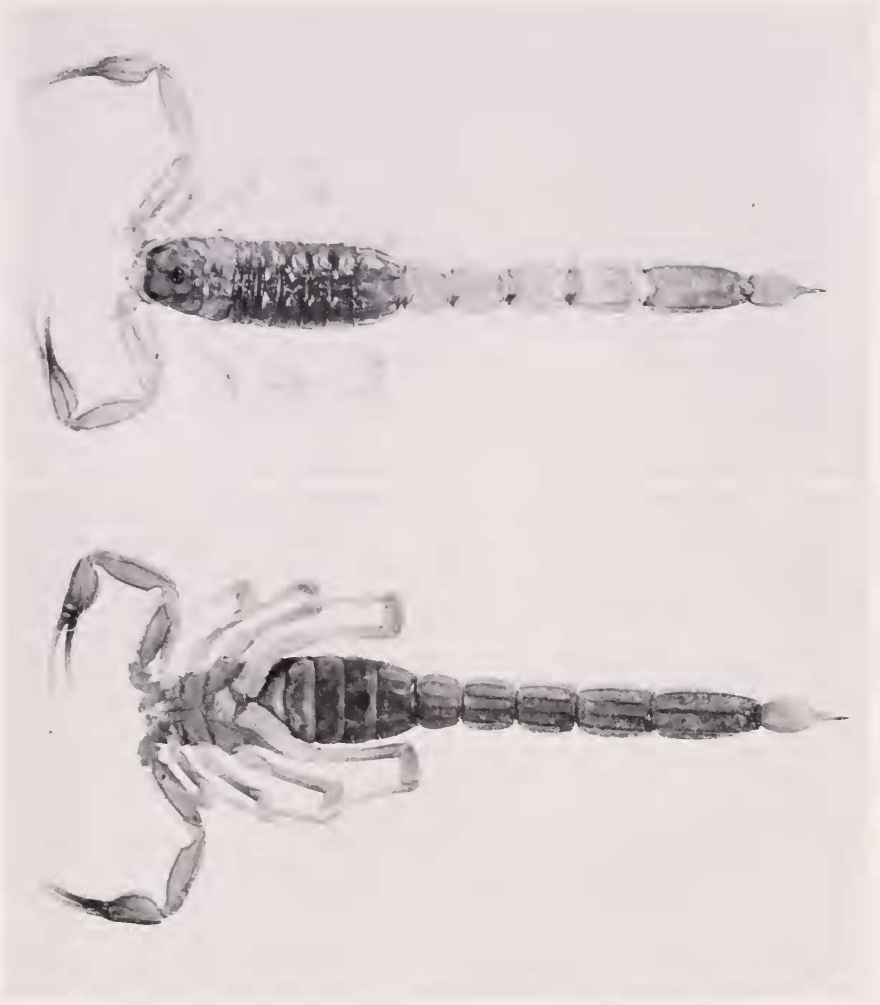

FIGURE 97. *Vaejovis gertschi*, topoparatype, male, dorsal and ventral views.

nates distally with elongate toothlike denticle; fixed finger with interior pair of trichobothria subbasal, distal one anterior to supernumerary granule 6 (most proximal one), proximal one posterior to supernumerary granule 6.

TYPE DATA AND ETYMOLOGY.—*Vaejovis dwyeri*, holotype (male): CAS, Type No. 12115; Isla Danzante, NW side of island, Baja California Sur, Mexico, 23–V–1970, S. C. Williams, V. F. Lee.

Named after Richard Dwyer, sponsor of Gulf of California island research.

DISTRIBUTION.—Danzante Island.

RECORDS.—Paratypes studied from **Baja California Sur, Mexico:** Isla Danzante, NW side, 23–V–1970 (Williams, Lee).

Vaejovis gertschi Williams

(Figures 53*I*, 54*G*, 97, 98)

Vejovis gertschi WILLIAMS, 1968b:317–321. HJELLE 1972:20–22. SOLEGLAD 1972:181.

Serradigitus gertschi (Williams). STAHNKE 1974a:132.

DIAGNOSIS.—Adults to 20–35 mm long. Base color brownish yellow with more or less distinct underlying dusky markings; metasoma with ventromedian and ventrolateral keels more or less outlined with underlying dusky markings. Pedipalp with long fingers, slender palm; ratio of movable-finger length to carapace length 0.9–1.4; ratio of chela length to palm width 4.3–5.1; ratio of movable-finger length to palm width 2.6–3.4; supernumerary granules 6 on fixed finger,

FIGURE 98. Distribution of *Vaejovis gertschi* (circles), *Vaejovis harbisoni* (triangles), and *Vaejovis minutis* (squares).

7 on movable finger; fixed finger with 35–50 primary-row denticles, these subdivided into two subrows by a slightly enlarged denticle; fixed finger with *id* and *ip* trichobothria proximal to supernumerary granule 5; palm with crenulate keels medially, smooth keels dorsally and laterally. Metasoma with ventromedian and ventrolateral keels well developed, these crenulate or serrate; segment I wider than long, segment II as wide as long or slightly wider, segment III as long as wide or slightly longer than wide; segment IV distinctly longer than wide; segment V with ratio of length to width 1.7–2.3. Pectine teeth 13–18 in males, 11–16 in females.

Similar to *Vaejovis hearnei* and *Vaejovis bechteli* but differs as follows: ventromedian keels crenulate on segments I–III (not smooth).

TYPE DATA.—*Vejovis gertschi*, holotype (male), allotype: CAS, Type No. 10171; 1.6 km E San Ysidro, San Diego County, California, 31–XII–1966, S. C. Williams.

DISTRIBUTION.—Baja California, from the U.S. border south to San Ignacio, and following islands: Raza, Salsipuedes, San Lorenzo, Tortuga, Partida, and Santa Catalina; central and southern California.

NEW RECORDS.—**Baja California Norte, Mexico:** 43 km S Tijuana, 2–XII–1962 (Craig, Dailey); 47 km E Tecate, 17–VII–1969 (Williams, Lee); 10 km S Tecate, 17–VII–1969 (Williams, Lee); 53 km S Tecate, 17–VII–1969 (Williams, Lee); 8 km SW La Rumorosa, Sierra Juárez, 1–IV–1969 (Williams); 1.6 km SW Tajo Canyon, 7–V–1961 (Lindsay); 4.0 km S Halfway House, 21–XI–1962 (Craig, Dailey); 10 km N La Misión, 14–VII–1969 (Williams, Lee); 6.4 km NNE El Sauzal, 15–VII–1969 (Williams, Lee); 8.0 km E Ensenada, 15–VII–1969 (Williams, Lee); 26 km E Ensenada, 15–VII–1969 (Williams, Lee); Punta Banda, 4–IV–1969 (Williams); 18 km E Puerto Santo Tomás, 11–VII–1969 (Williams, Lee); Santo Tomás Valley, 5–IV–1969 (Williams); Mike's Sky Ranch, Sierra San Pedro Mártir, 14–15–VI–1973 (Williams, Blair); 43 km S San Vicente, 12–VII–1969 (Williams, Lee); Marker K214 past San Vicente, 23–XI–1962 (Craig, Dailey); 8.0 km W Meling Ranch, 13–VII–1969 (Williams, Lee); 22.5 km E Meling Ranch, 13–VII–1969 (Williams, Lee); 24 km E San Telmo de Arriba, 13–VII–1969 (Williams, Lee); 10 km E San Telmo de Arriba, 13–VII–1969 (Williams, Lee); 27 km N Colonia Guerrero, 5–XI–1953 (CIS); Hamilton Ranch, 24–IV–1963 (Leech, Arnaud); 43 km SE El Rosario, 27–III–1956 (Wood, SDMNH); Aguajito Summit, 7–IV–1969 (Williams); 10 km E El Turquesa Mine, 27–V–1961 (Lindsay); 9.3 km S Rancho Santa Ynez, 19–XII–1973 (Johnson); 6.4 km S El Arenoso, 8–IV–1969 (Williams); 3.2 km NW summit of Aguajito Grade, 7–IV–1969 (Williams); 0.8 km S La Virgen, 9–IV–1969 (Williams); 1.0 km E San Borja, 25–XI–1961 (Parrish); 4.8 km N Manuela, 22–VI–1968 (Williams, Cazier); 55 km NNW Manuela, 22–VI–1968 (Williams, Cazier); Jaraguay Summit, 27–III–1973 (Szerslip, CIS); Las Arrastras de Arrida, 3–IV–1973 (Szerslip, CIS); 13.0 km NW Pedregosa, 17–XII–1962 (Parrish); 30.5 km N Laguna Chapala, 9–IV–1969 (Williams); Calamajué Arroyo, 15–IV–1968 (Williams, Cazier); Bahía de los Ángeles, 17–VI–1968 (Williams, Cazier); 18 km SW Punta Prieta, 15–IV–1969 (Williams); 40 km S Punta Prieta, 9–II–1947 (LaRivers, CIS); Isla Raza, 26–III–1962 (Soule, Wiggins); Isla Salsipuedes, 14–III–1971 (Lee); Isla San Lorenzo del Norte, N end, 23–X–1964 (Sloan); Misión San Borja, 20–VI–1968 (Williams, Cazier); 18 km N Agua de Refugio Rancho, 25–II–1966 (Roth, AMNH); 6.4 km N Rancho Mezquital, 16–IV–1969 (Williams); 18 km N Rancho Mezquital, 15–IV–1969 (Williams); 8 km N Rosarito Beach, 10–XI–1963 (Barr). **Baja California Sur:** Isla Tortuga, 21–III–1971 (Lee); San Ignacio, 24–VI–1968 (Williams, Cazier); Isla Santa Catalina, SW end, 21–III–1970 (Williams, Lee); Isla Partida, 26–III–1962 (Harbison, SDMNH).

REMARKS.—*Vaejovis gertschi* is polytypic. At the type-locality in San Diego, California, the population is quite homogeneous in structure, coloration, and size. This typical form extends from the Los Angeles basin in California south into northwestern Baja California Norte. It appears limited to the Pacific coastal and foothills regions. In Baja California, *V. gertschi* extends into the arid terrain of the Gulf side of the peninsula and onto some of the more northern islands in the Gulf. In the more southern extent

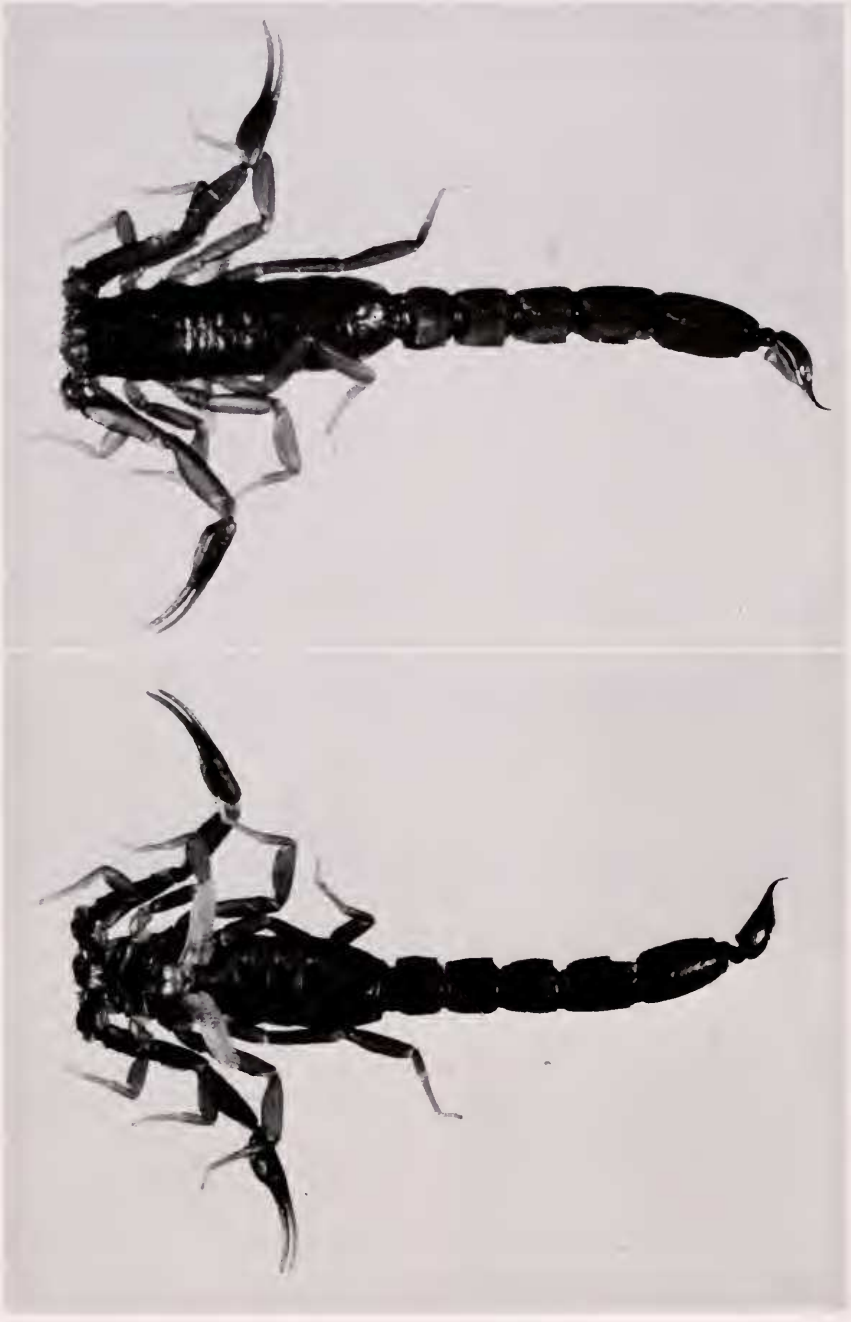

FIGURE 99. *Vaejovis gigantaensis*, holotype, male, dorsal and ventral views.

of its range, the morphological stability (as observed in the California populations) breaks down in that individuals tend to be more variable in coloration and body proportions. Generally, populations in the Gulf region tend to be lighter in color and have more elongate pedipalp fingers.

Vaejovis gertschi is common in chaparral and

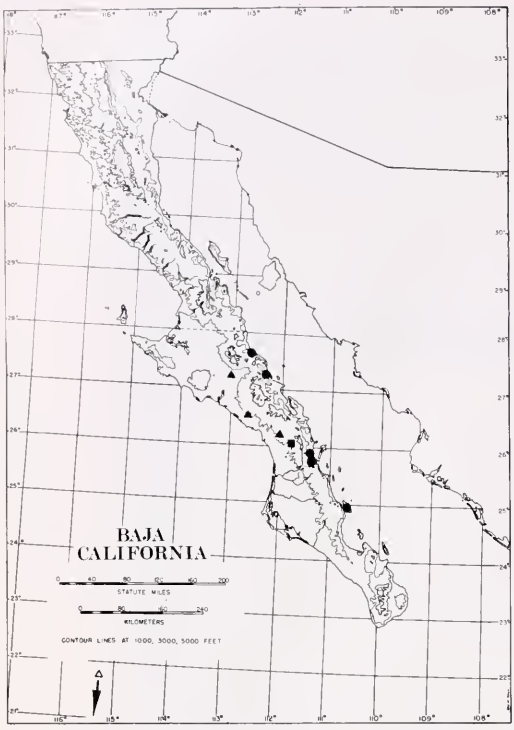

FIGURE 100. Distribution of *Vaejovis gigantaensis* (squares), *Vaejovis hearnei* (circles), *Vaejovis janssi* (open triangles), and *Vaejovis peninsularis* (closed triangles).

agave communities along the Pacific coast of the peninsula. It is commonly encountered under dead vegetation, rocks, and surface litter. It also appears to occupy crevices in the ground, but it does not burrow.

Vaejovis gigantaensis Williams, new species
(Figures 53*G*, 54*E*, 99, 100; Table 1)

DIAGNOSIS.—Adults to 21 mm long. Base color brownish yellow to coffee. Chela conspicuously slender; ventromedian and ventrolateral keels obsolete on metasomal segments IV and V. Pedipalp fixed finger with 45 or fewer primary-row denticles, these subdivided into two, more or less distinct subrows by slightly enlarged denticle; ratio of movable-finger length to carapace length about 1.0; ratio of chela length to palm width 5.5–5.9; ratio of movable-finger length to palm width 3.5 or greater; ratio of carapace width to palm width 2.5 or greater. Metasomal segment III slightly wider than long, segment IV slightly longer than wide. Pectine teeth about 17 in males.

Similar to *Vaejovis minutis* but differs as follows: ventromedian and ventrolateral keels of metasoma obsolete; palm narrower, ratio of movable-finger length to palm width 3.5 or greater; ratio of chela length to palm width 5.5 or greater. Pectines with more numerous teeth, 17 in males (not 12–15 in males).

DESCRIPTION OF HOLOTYPE.—**Male.** Coloration: base color of cuticle yellowish brown; carapace, mesosomal dorsum and walking legs with faint underlying dusky markings; pectines whitish; pedipalp fingers similar to palm in color. Carapace with frontal margin broadly emarginate; 3 pairs lateral ocelli; carapace surface densely granular. Metasoma with dorsal keels uniformly crenulate on segments I through IV; dorsolateral keels more or less uniformly crenulate on segments I–III, obsolete to irregularly granular on segments IV and V; ventrolateral keels irregularly crenulate on segment I, obsolete to irregularly crenular on IV, obsolete on V; ventromedian keels obsolete on segments I through V; segments IV and V appear rounded ventrally. Telson with vesicle smooth. Pedipalp with fingers terminating distally in elongate, toothlike denticle; fixed finger with trichobothrium *id* about midway between supernumerary denticles 5 and 6, trichobothrium *ip* slightly posterior to supernumerary denticle 6, trichobothrium *db* between supernumerary denticle 6 and origin of finger; chela slender, palm narrow, ratio of chela length to width of palm 5.75; ratio of movable-finger length to basal width 6.5; ratio of movable-finger length to palm width 3.7; palm with keels smooth laterally and dorsally, keels irregularly crenulate medially; fingers only contact at distal termination when chela closed, elongate space remaining between fingers when chela closed; palm equals brachium in width; ratio of carapace width to palm width 2.7; fixed finger with primary-row denticles subdivided into 2 subrows by a slightly enlarged denticle.

TYPE DATA.—*Vaejovis gigantaensis*, holotype (male): CAS, Type No. 12178; 11.7 km N San José de Comondú, Baja California Sur, Mexico, 21–VI–1967, E. L. Sleeper, E. M. Fisher.

DISTRIBUTION.—Sierra Giganta, north of San José de Comondú.

RECORDS.—Paratypes studied from **Baja California Sur, Mexico:** 11.7 km N San José de Comondú, 21–VI–1967 (Sleeper, Fisher).

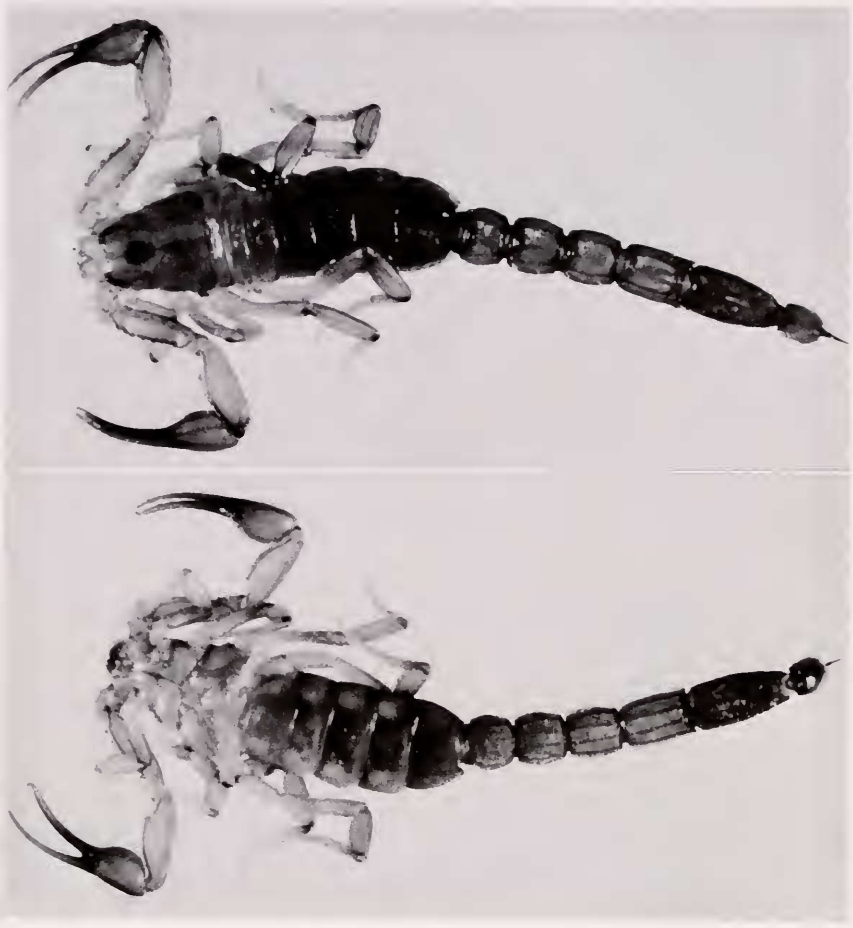

FIGURE 101. *Vaejovis haradoni*, holotype, male, dorsal and ventral views.

REMARKS.—The specimen here designated holotype was previously at Long Beach State University but was permanently transfered to the type collection of the California Academy of Sciences by Dr. William Stockton.

Vaejovis haradoni Williams, new species
(Figure 101; Tables 1, 2)

DIAGNOSIS.—Adults to 21 mm long. Base color brownish to gold, metasomal segment V darker than preceding segments. Pedipalp with long fingers, slender palm; ratio of movable-finger length to carapace length 0.8–0.9; ratio of chela length to palm width 4.0–4.2; ratio of movable-finger length to palm width 2.4–2.6; fixed finger with less than 54 primary-row denticles, these subdivided into two subrows by a slightly enlarged denticle. Metasomal segment III length approximating width, segment IV length-to-width ratio about 1.4–1.5; ventromedian keels smooth to irregularly crenular on segment I, crenular on segments II through V; ventrolateral keels uniformly crenular on segments I through V. Pectine teeth 13–15 in males, 12–14 in females.

Similar to *Vaejovis gertschi* and *Vaejovis minutis*. Distinguished from *V. gertschi* as follows: ratio of movable-finger length to palm width 2.75 or less; ratio of fixed-finger length to palm length 1.2 or less; ratio of chela length to palm width 4.2 or less. Distinguished from *V. minutis* as follows: ventromedian keels of metasoma crenular; ratio of metasoma length to width of segment V 5.8 or more; ratio of metasomal segment V length to width 1.9 or more.

DESCRIPTION OF HOLOTYPE.—**Male.** Color-

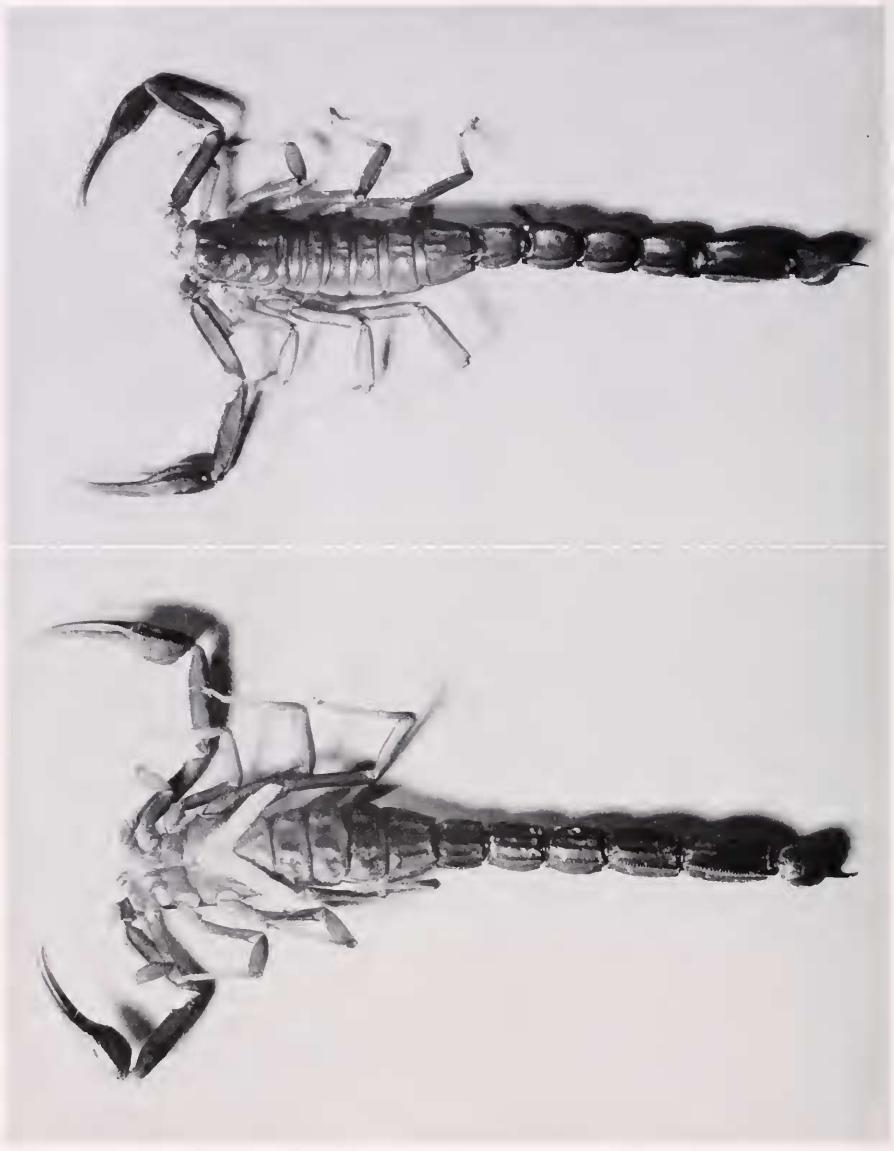

FIGURE 102. *Vaejovis harbisoni*, topoparatype, male, dorsal and ventral views.

ation: base color of entire body brownish yellow; carapace and mesosomal dorsum with more or less distinct underlying dusky markings; metasomal segment V darker and more reddish than anterior metasomal segments; pedipalp fingers slightly more brownish than palm. Carapace anterior margin with broad median emargination; carapace surface finely granular; 3 pairs lateral ocelli. Mesosoma with terga granular, last tergum with 2 pairs serrate lateral keels; 1 pair crenulate lateral keels on last sternum. Metasoma with ventrolateral keels regularly crenulate on segments I–V; ventromedian keels smooth to irregularly crenulate on segments I–III, regularly crenulate on segments IV and V. Telson with ventral surface of vesicle with smooth irregular surface, covered with about 7 pairs long brownish hairs; broad subaculear tubercule. Pedipalp with fingers terminating distally in elongate clawlike denticle; fin-

gers elongate, palm narrow; palm with keels smooth dorsally; finger margins unscalloped; fixed finger with trichobothrium *id* slightly posterior to supernumerary granule 5, trichobothrium *ip* slightly anterior to supernumerary granule 6, trichobothrium *db* slightly anterior to origin of fixed finger.

Description of Allotype.—**Female.** Similar to holotype except as follows: generally larger in most body dimensions; pedipalp palm slightly more swollen; fingers slightly more elongate; ventral surface of metasoma slightly more conspicuously hirsute.

Type Data and Etymology.—*Vaejovis haradoni*, holotype (male), allotype: CAS, Type No. 12116; 121 km NW La Paz, Baja California Sur, Mexico, 4–VII–1968, S. C. Williams, M. A. Cazier.

Named after Richard Haradon, collector and student of North American scorpions.

Distribution.—Los Aripes and La Paz region and Isla Santa Catalina.

Records.—Paratypes studied from the following localities. **Baja California Sur, Mexico:** Isla Santa Catalina, W side, 9–IV–1962 (Parrish); Punta Arena, NW end of Isla Santa Catalina, 24–VI–1964 (Parrish); Isla Santa Catalina, S end, 25–VI–1964 (Parrish); 56.8 km NW Los Aripes, 27–VII–1968 (Williams, Bentzien, Bigelow); 24.1 km NW Los Aripes, 27–VII–1968 (Williams, Bentzien, Bigelow); 34.4 km W Los Aripes, 25–VII–1968 (Williams, Bentzien, Bigelow); 121 km NW La Paz, 4–VII–1968 (Williams, Cazier).

Vaejovis harbisoni Williams

(Figures 53*J*, 54*I*, 98, 102)

Vejovis harbisoni Williams, 1970b:281–286. Soleglad 1972:181.

Serradigitus harbisoni (Williams). Stahnke 1974a:132.

Diagnosis.—Adults to 50 mm long. Base color of adults dark brown to chocolate, juveniles lighter to dirty whitish. Pedipalp with elongate fingers; ratio of movable-finger length to carapace length 1.1–1.3; ratio of chela length to palm width 4.8–5.5; ratio of movable-finger length to palm width 3.1–3.8; fixed finger with 7 or more supernumerary granules (usually 12–18); fixed finger longer than carapace; fixed finger with about 49–54 denticles in primary row, these subdivided into two subrows by an enlarged denticle; fixed finger with trichobothria *id* and *ip* both on distal half of fixed finger. Metasoma with ventrolateral keels crenulate; ventromedian keels smooth to obsolete on segments I–III, better developed and smooth to crenulate on segments IV and V; segment I as wide as or wider than long; segment II longer than wide; segment V with ratio of length to width about 1.8–2.0. Pectine teeth 21–23 in females, 25–27 in males.

Similar to *Vaejovis adcocki* but differs as follows: fixed finger with more than 6 supernumerary granules (not with 6); ratio of humerus length to humerus width 4.0 or greater; ratio of movable-finger length to length of metasomal segment V 1.1 or greater.

Type Data.—*Vejovis harbisoni*, holotype (male), allotype: CAS, Type No. 10419; Calamajué Arroyo, Baja California Norte, Mexico, 15–16–VI–1968, S. C. Williams, M. A. Cazier.

Distribution.—Northeastern desert region of Baja California south to near Rancho Las Parras, and following islands: Ángel de la Guarda, Méjia, and Cerralvo.

New Records.—**Baja California Norte, Mexico:** Guadalupe Canyon, 29–XII–1966 (Hom); 80 km NW San Felipe, Arroyo Jaquejel, 25–XI–1960 (Roth, AMNH); Puertecitos, 10–VI–1968 (Williams, Cazier); Oakie Landing, 43 km S Puertecitos, 12–VI–1968 (Williams, Cazier); Isla Méjia, E side, 19–IV–1962 (Campbell); Puerto Refugio, Isla Ángel de la Guarda, 16–III–1962 (Belvedere Expedition); Isla Ángel de la Guarda, 15–III–1962 (Belvedere Expedition); Isla Ángel de la Guarda, 14–III–1971 (Lee); 0.8 km W Rancho Las Parras, 26–V–1970 (Williams, Lee); Isla Cerralvo, 16–IV–1962 (Harbison, SDMNH).

Remarks.—This species prefers rocky volcanic habitats. It has been found in rock slides and along rocky slopes in the spaces created by accumulated fragmented rock. In the evenings, individuals may occasionally be found on exposed rock surfaces, but most activity appears confined to nonexposed spaces and crevices.

Juveniles of this species appear different from adults in proportions and in their pale coloration. This species shows geographic variability in intensity of melanism, proportion of body parts, crenulation of metasomal keels, and number of supernumerary granules. Generally, specimens from the Gulf islands are lighter in base coloration than those from volcanic habitats.

Vaejovis hearnei Williams, new species

(Figures 53*H*, 100, 103; Tables 1, 2)

Diagnosis.—Adults to 18–26 mm long. Base color of cuticle light brownish with underlying dusky markings dorsally. Pedipalp with long fingers, slender palm; ratio of movable-finger length to carapace length about 0.9–1.0; ratio of chela length to palm width about 4.4–4.6; ratio of movable-finger length to palm width about

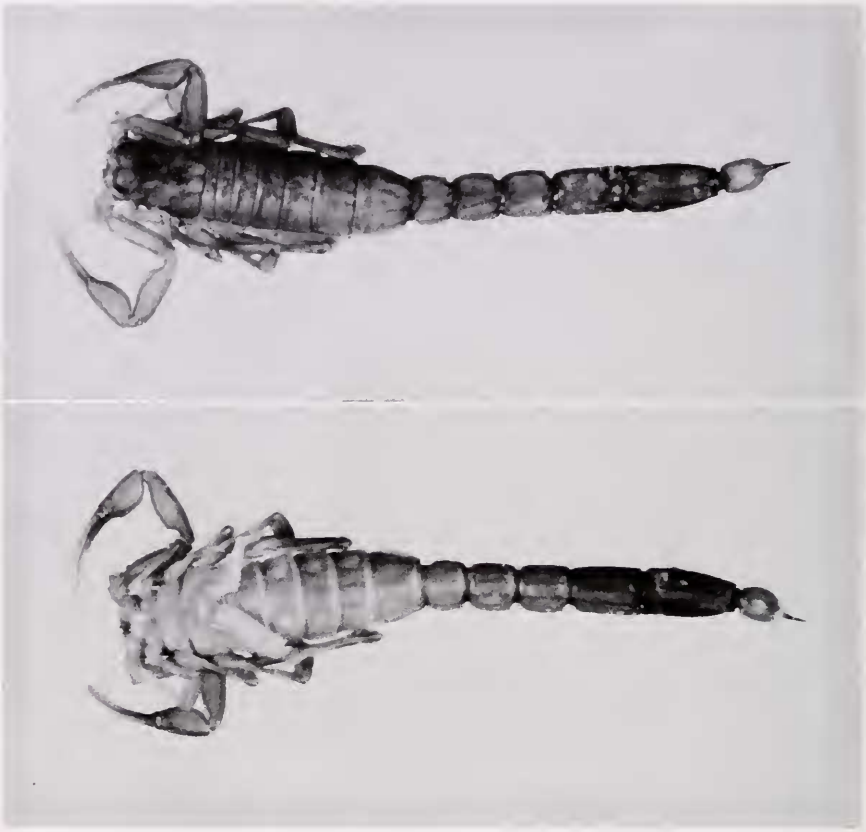

FIGURE 103. *Vaejovis hearnei*, holotype, male, dorsal and ventral views.

2.8–3.0; fixed finger with 6 supernumerary granules, about 40–45 denticles in primary row, these subdivided into two or three subrows by a slightly enlarged denticle or not subdivided. Metasoma with ventromedian keels smooth to obsolete on segments I and II, reduced and smooth on III, irregularly crenulate on IV; ventrolateral keels uniformly crenulate on segments I–IV; segments I and II distinctly wider than long, segment III as wide as long or slightly wider; segment IV longer than wide, segment V with ratio of length to width about 1.7–1.8. Telson distinctly narrower than metasomal segment V. Ratio of carapace width to palm width 2.0 or more. Pectine teeth 18–19 in males, 17 in females.

Similar to *Vaejovis gertschi* but differs as follows: obsolete or smooth ventromedian keels on metasomal segments I–III (not crenular).

DESCRIPTION OF HOLOTYPE.—**Female.** Coloration: base color of cuticle golden-brown; carapace and mesosomal dorsum with underlying dusky markings; metasomal segments with light dusky patches; pedipalp fingers light reddish, slightly contrasting with more golden palm; pectines whitish. Carapace frontal margin with slight median emargination; 3 pairs lateral ocelli; carapace surface lightly granular. Metasoma with dorsal and dorsolateral keels well developed and uniformly granular; ventrolateral keels well developed and uniformly crenular on segments I through V; ventromedian keels obsolete to smooth on segments I and II, reduced and smooth on segment III, irregularly crenulate on segment IV; regularly crenulate on segment V; segment III ratio of length to width 0.94; segment IV ratio of length to width 1.33. Telson with ventral surface of vesicle with many broad, low tubercules; broad subaculear tubercule. Pedipalp with elongate fingers; fingers terminate distally in elongate denticle, terminal tooth on fixed finger slightly longer than depth of finger

at first supernumerary granule; ratio of chela length to palm length 4.5; fixed finger with trichobothrium *id* slightly distal to supernumerary granule 5, trichobothrium *ip* midway between supernumerary granules 5 and 6, trichobothrium *db* midway between supernumerary granule 6 and origin of fixed finger; palm with dorsal and lateral keels reduced, keels crenular medially.

Description of Allotype.—**Male.** Similar to holotype but differs as follows: slightly lighter in coloration, pedipalp fingers more dusky than reddish; smaller total length; more pectine teeth; vesicle of telson not as hirsute.

Type Data and Etymology.—*Vaejovis hearnei*, holotype (female), allotype, 2 topoparatypes: CAS, Type No. 12117; 32 km S Santa Rosalía, Baja California Sur, Mexico, 19–IV–1969, S. C. Williams.

Named after Thomas P. Hearne, sponsor of biological explorations of the islands of the Gulf of California.

Distribution.—Punta Trinidad to Loreto, and Isla San José.

Records.—Paratypes studied from the following localities. **Baja California Sur, Mexico:** Punta Trinidad, 20–21–III–1971 (Lee); Santa Rosalía, 19–II–1966 (Roth, AMNH); 32 km S Santa Rosalía, 19–IV–1969 (Williams); 11.6 km SW Loreto, Arroyo Las Parras, 26–V–1970 (Williams, Lee); 13.4 km SW Loreto, 26–V–1970 (Williams, Lee); 27 km S Loreto, 27–V–1970 (Williams, Lee); 0.8 km W Rancho Las Parras, 26–V–1970 (Williams, Lee); Isla San José, 12–IV–1962 (Harbison, SDMNH).

Vaejovis janssi Williams, new species

(Figures 53A, 100, 104; Tables 1, 2)

Vejovis mexicanus decipiens Hoffmann [part]. Vázquez 1960:219–221.

Diagnosis.—Adults to 51–58 mm long. Base color dark brown to chocolate. Pedipalp with elongate fingers, ratio of movable-finger length to carapace length 1.0–1.5; ratio of chela length to palm width 4.2–5.0; ratio of movable-finger length to palm width 2.6–3.4; fixed finger with about 80–95 denticles in primary row, these subdivided into 6 subrows by 5 slightly enlarged denticles, 6 supernumerary granules (7 on movable finger); metasoma with segment I as wide as long or slightly wider; segment II as long as wide or longer, segment III longer than wide; segment V length-to-width ratio 1.9–2.8. Pectine teeth 21–22 in males, 18–21 in females.

Similar to *Vaejovis peninsularis*, but differs as follows: metasomal segment II with length equal to or greater than width (not wider than long); metasomal segment V with length greater than twice width (not with length less than twice width); metasoma with ventromedian keels smooth to crenulate on segment III and irregularly crenulate on segment IV (not obsolete); metasoma with ventrolateral keels of segment II distinctly crenulate (not essentially smooth with several irregular crenulations); stigma 4–5 times longer than wide (not 3–4 times longer than wide).

Description of Holotype.—**Male.** Coloration: entire body dark yellowish brown, legs and pedipalps slightly lighter; carapace and mesosomal dorsum with underlying dusky pattern; fingers similar to palm in color; legs with underlying dusky markings; pectines whitish. Carapace frontal margin broadly emarginate, prominent median notch; three pairs lateral ocelli; carapace surface coarsely granular. Mesosoma with terga 1 through 6 finely granular; tergum 7 with obsolete dorsomedian keel and two pairs well developed granular dorsolateral keels; sterna smooth, sternum 7 with one pair reduced lateral keels. Metasoma with ventrolateral keels distinctly crenulate to serrate on segments I–V; ventromedian keels obsolete on segment I, crenulate on segments II–IV, serrate on segment V; dorsal and dorsolateral keels serrate or crenulate. Telson vesicle covered with small inconspicuous granules, and about 8 pairs large reddish setae ventrally; small subaculear tubercule. Pedipalp with elongate fingers, moderately slender palm; palm covered with small, rounded granules; palm keels more or less granular; ratio of movable-finger length to basal width 4.7; fixed finger with primary-row denticles subdivided into 6 subrows by 5 slightly enlarged denticles; fixed finger with trichobothria *id* and *ip* both proximal to supernumerary granule 6.

Description of Allotype.—**Female.** Similar to holotype but differs as follows: larger general body size; coloration darker, underlying dusky markings more pronounced and more marbled in pattern; pectine with fewer teeth; cuticle generally more coarsely granular; ventromedian keels of metasoma somewhat more reduced, tending toward obsolescence on segment II.

Type Data and Etymology.—*Vaejovis janssi*, holotype (male), allotype, and 28 topoparatypes: CAS, Type No. 12118; Isla Socorro, Islas Revillagigedo, Baja California Sur, Mexico, 11–XI–1971, L. Gomez.

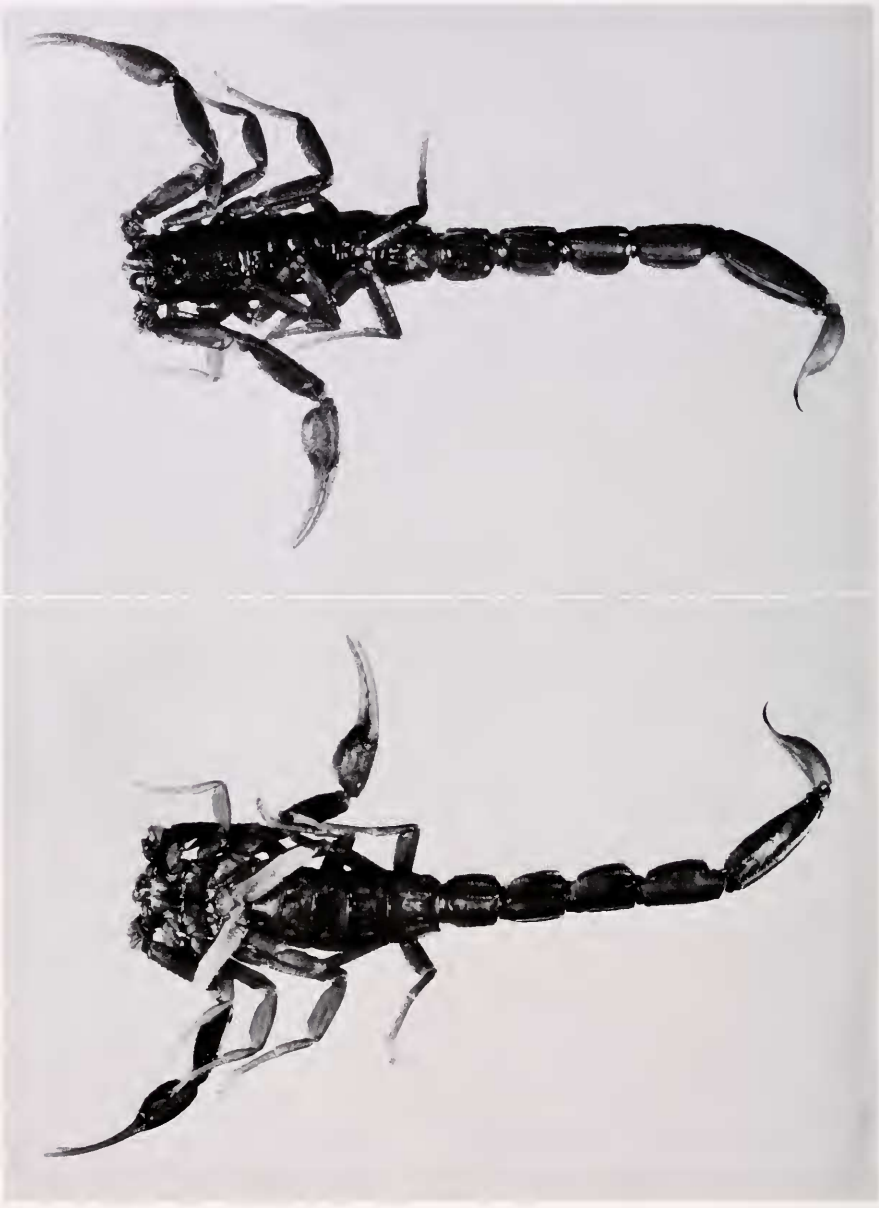

FIGURE 104. *Vaejovis janssi*, holotype, male, dorsal and ventral views.

Named after Edwin Janss, Jr., sponsor of biological expeditions to the Revilla Gigedo Islands.

DISTRIBUTION.—Isla Socorro.

RECORDS.—Paratypes studied from the following localities. **Baja California** Sur: Isla Socorro, Islas Revillagigedo, 1957 (Moran); 3-III-1925 (Keifer); 11-XI-1971 (Gomez).

REMARKS.—In 1960, Vázquez identified a series of scorpions from Isla Socorro as *Vaejovis mexicanus decipiens* Hoffmann. The species which she studied is the species here described and named as *V. janssi*. *Vaejovis m. decipiens* in all probability does not occur on Isla Socorro nor on any of the other islands associated with Baja California. *Vaejovis janssi* is similar to *V.*

mexicanus decipiens, but differs as follows: pectines with 21–22 teeth in males, 18–21 in females (not 23–24 teeth in males, 22 in females); movable finger of pedipalp distinctly shorter than metasomal segment V in both sexes (not longer in males and shorter in females); males with metasomal segment II longer than wide (not with length equalling width); aculeus shorter than vesicle (not slightly longer); ventromedian keels of metasomal segment I obsolete (not reduced and faint with a few posterior granulations).

Vaejovis janssi is the only scorpion known from Socorro Island. Perhaps this accounts for the varied habitat adaptations of this species. It was collected in jungle areas, in heavy brush, in rocky terrain, in sand communities, and on trees as far up as about 25 ft (7.6 m) above the ground. It was reported most abundant in wild fig trees, and some were taken within 10 ft (3 m) of the surf. This species has adopted a way of life similar to that of insular populations of *Centruroides*.

Vaejovis littoralis Williams, new species
(Figures 53*D*, 54*B*, 55*H*, 93; Table 1)

Diagnosis.—Base color of body golden-yellow with underlying dusky marbling. Pedipalp finger elongate, ratio of movable-finger length to carapace length 0.8–1.0; fixed finger with about 35–45 primary-row denticles, these more or less subdivided into about 4 subrows; fixed finger not scalloped, fingers when closed do not form long distinct gap; fingers broad and distinctly granular dorsally; ratio of movable-finger length to width at base 4.0–5.5; metasoma with segment III as wide as or wider than long; segment IV not wider than segment III; segment IV length-to-width ratio 1.0–1.3; ventromedian and ventrolateral keels crenular. Pectine teeth 12–14 in females, 14–16 in males.

Description of Holotype.—**Female.** Coloration: base color of cuticle golden-yellow; carapace and mesosomal terga with underlying light-dusky marbling; pedipalp fingers with reddish pigmentation in contrast to more golden palm. Carapace frontal margin with slight median emargination; three pairs lateral ocelli; carapace surface densely granular. Metasoma with dorsal and dorsolateral keels strongly raised, crenular on segments I–IV; ventromedian and ventrolateral keels well developed and crenulate on segments I–V. Telson with ventral surface of vesicle coarsely tubercular; large tubercules in subaculear region. Pedipalp with movable and fixed fingers each terminating distally in enlarged, elongate denticle; fixed finger with primary-row denticles subdivided into about 4 more or less distinct subrows by slightly enlarged denticles; palm with keels on lateral and dorsal surfaces smooth to crenulate, these more crenular medially; fixed finger with trichobothria *id* and *ip* both proximal to supernumerary granule 6, trichobothrium *db* positioned directly above origin of finger.

Type Data.—*Vaejovis littoralis*, holotype (female): CAS, Type No. 12119; Isla San José, Golfo de California, Baja California Sur, Mexico, 26–V–1971, V. F. Lee.

Distribution.—Following islands: San José, Danzante, and Ángel de la Guarda.

Records.—Paratypes studied from the following localities. **Baja California Norte, Mexico:** Puerto Refugio, Isla Ángel de la Guarda, 16–III–1962 (Belvedere Expedition). **Baja California Sur:** Isla Danzante, NW side, 23–V–1970 (Williams, Lee).

Remarks.—*Vaejovis littoralis* is unique because it lives in the intertidal zone. Juveniles were observed on Isla Danzante migrating up the beach just above the changing tides. They apparently use the coarse gravel and beach wrack for shelter and as a feeding ground. The holotype was collected under a small rock in the high-tide zone. Paratypes were active on the exposed-beach habitat during daylight hours.

Vaejovis minutis Williams
(Figures 53*F*, 54*F*, 98, 105)

Vejovis minutis Williams, 1970b:286–290. Soleglad 1972:181.
Serradigitus minutis (Williams). Stahnke 1974a:132.

Diagnosis.—Adults to 14–27 mm long (depending on habitat). Pedipalp with 6 supernumerary granules on fixed finger; 35–45 primary-row denticles on fixed finger, these subdivided into two subrows by slightly enlarged denticle, or not subdivided; ratio of movable-finger length to carapace length 0.7–0.9; ratio of chela length to palm width 3.7–5.0; ratio of movable-finger length to palm width 2.3–3.0; ratio of carapace width to palm width 2.1–2.7. Telson narrower than metasomal segment V. Metasoma with segment III as wide as long or wider; segment IV longer than wide; ventromedian keels obsolete on segments I–III, smooth to irregularly crenulate on segments IV and V; ventrolateral keels

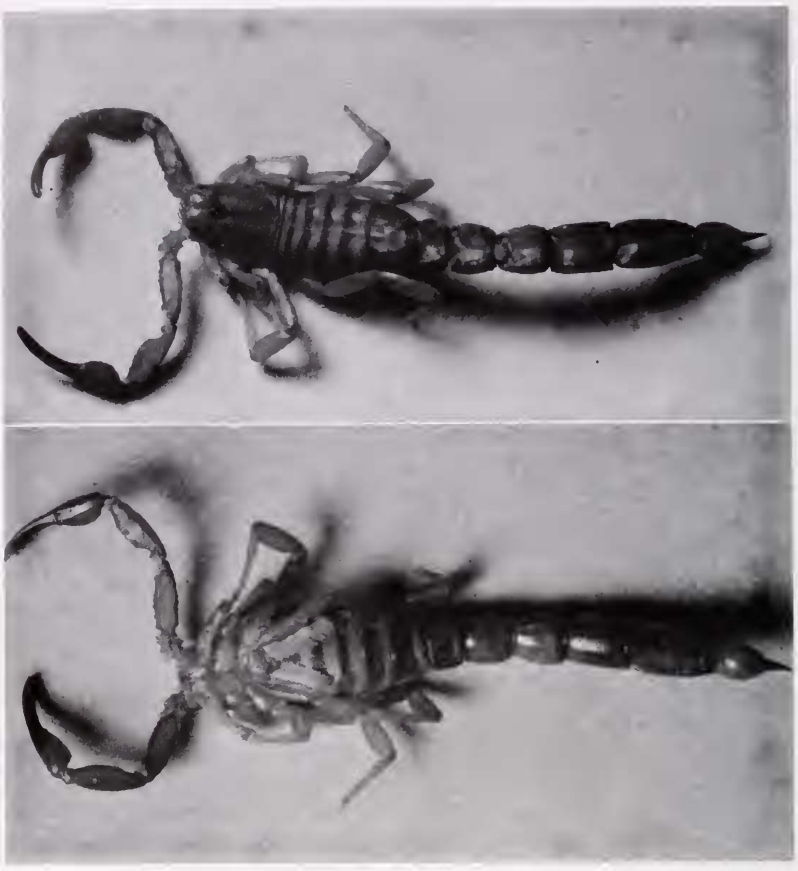

FIGURE 105. *Vaejovis minutis*, topoparatype, male, dorsal and ventral views.

smooth to irregularly crenulate on segments I–V. Pectine teeth 12–17 in males, 11–15 in females.

Similar to *Vaejovis haradoni* and *Vaejovis gigantaensis*. Distinguished from *V. haradoni* as follows: ventromedian keels obsolete on segments I–III (not crenulate); ventromedian keels of segment IV smooth to irregularly crenulate (not uniformly crenulate); ventrolateral keels on segments I–IV smooth to irregularly crenulate (not uniformly crenulate). Distinguished from *V. gigantaensis* as follows: ventromedian and ventrolateral keels of segment V present and developed (not obsolete); ratio of chela length to palm width greater than 5.2.

TYPE DATA.—*Vejovis minutis*, holotype (male), allotype: CAS, Type No. 10423; 8.0 km SW La Paz, Baja California Sur, Mexico, 3–VIII–1968, S. C. Williams, M. A. Cazier.

DISTRIBUTION.—San José de Comondú south to Cabo San Lucas, and following islands: Carmen, Danzante, San José, San Francisco, Partida, Cerralvo.

NEW RECORDS.—**Baja California Sur, Mexico:** 35 km N San José de Comondú, 16–II–1966 (Roth, AMNH); 7.6 km NE Comondú, 16–II–1966 (Roth, AMNH); Isla de Carmen, Puerto Balandra, 24–III–1971 (Lee); Isla Danzante, N side, 23–V–1970 (Williams, Lee); Isla San José, Arroyo de Aguada, NE side, 11–IV–1962 (Belvedere Expedition); Isla San Francisco, SW side, 25–V–1969 (Williams); Isla Partida, 20–IV–1962 (Parrish, Lindsay); Isla Cerralvo, Bahía Limona, 31–V–1969 (Williams); 3.2 km E Pichilingue, Tecolate, 25–XI–1973 (Williams, Mullinex); El Triunfo, 3–II–1965 (Roth, AMNH); 1.6 km E Los Aripes, 8–VII–1968 (Cazier); 14.5 km N Todos Santos, 4–V–1969 (Williams); 6.3 km SW Punta Palmilla, 17–VII–1968 (Williams); Cabo San Lucas, 20–VII–1968 (Williams, Cazier).

REMARKS.—*Vaejovis minutis* is a variable species that forms a number of races throughout

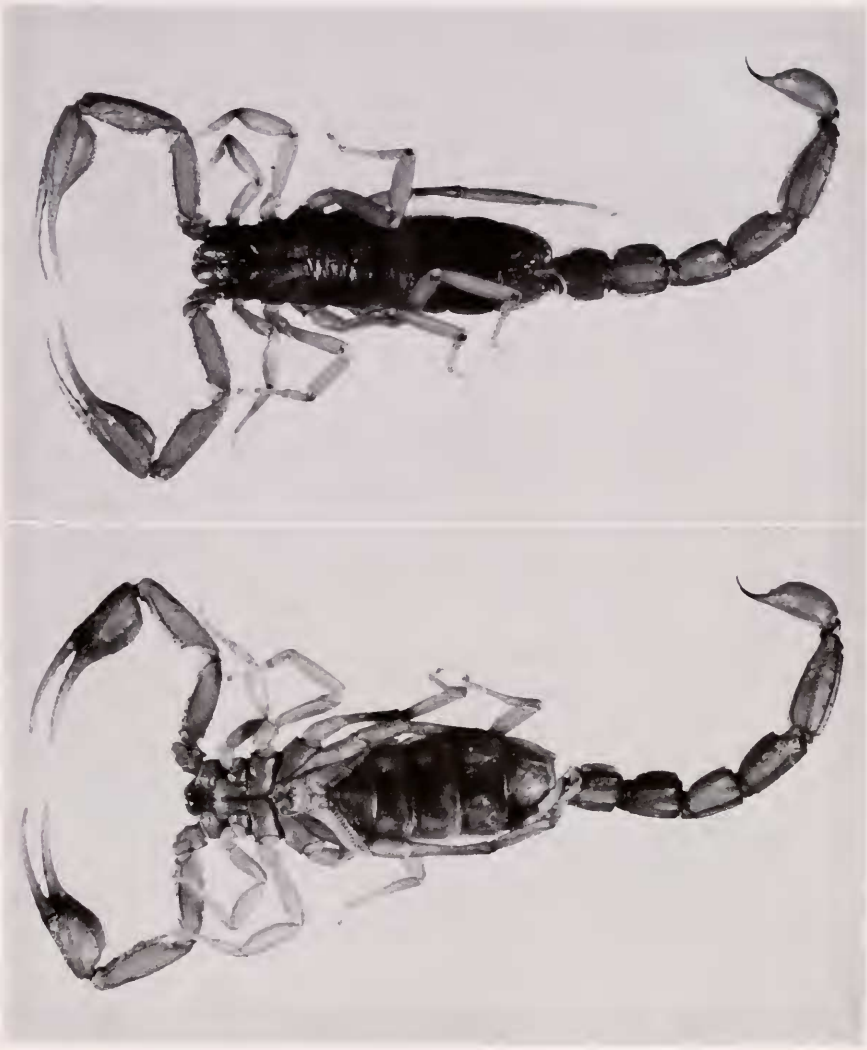

FIGURE 106. *Vaejovis pacificus*, holotype, female, dorsal and ventral views.

its distribution. In the Cabo San Lucas region a race occurs that is distinguished by its distinctly larger adult body size and by slightly larger numbers of pectine teeth. On Isla Cerralvo a race is found that can be distinguished by a darkly pigmented metasomal segment V. On Isla Danzante a race occurs that differs in having pectines with larger numbers of teeth (similar to that of the Cape race). The population in the La Paz region (type-locality) is distinctive for the species because of its very small size. In this respect the "typical forms" do not characterize the species as generally found throughout its range.

Vaejovis pacificus Williams, new species
(Figures 53*C*, 54*C*, 93, 106; Table 1)

DIAGNOSIS.—Adults to 39 mm long. Base color of body golden-yellow; pedipalp fingers similar to palm in color. Pedipalp fixed finger with 6 supernumerary granules; ratio of movable-finger length to carapace length about 1.0–1.1; ratio of chela length to palm width about 4.1–4.3; ratio of movable-finger length to palm width about 2.4–2.6; fixed finger with about 35–50 primary-row denticles, these subdivided into 4 or 5 subrows by slightly enlarged denticles. Metasoma with segment IV wider than segment III; seg-

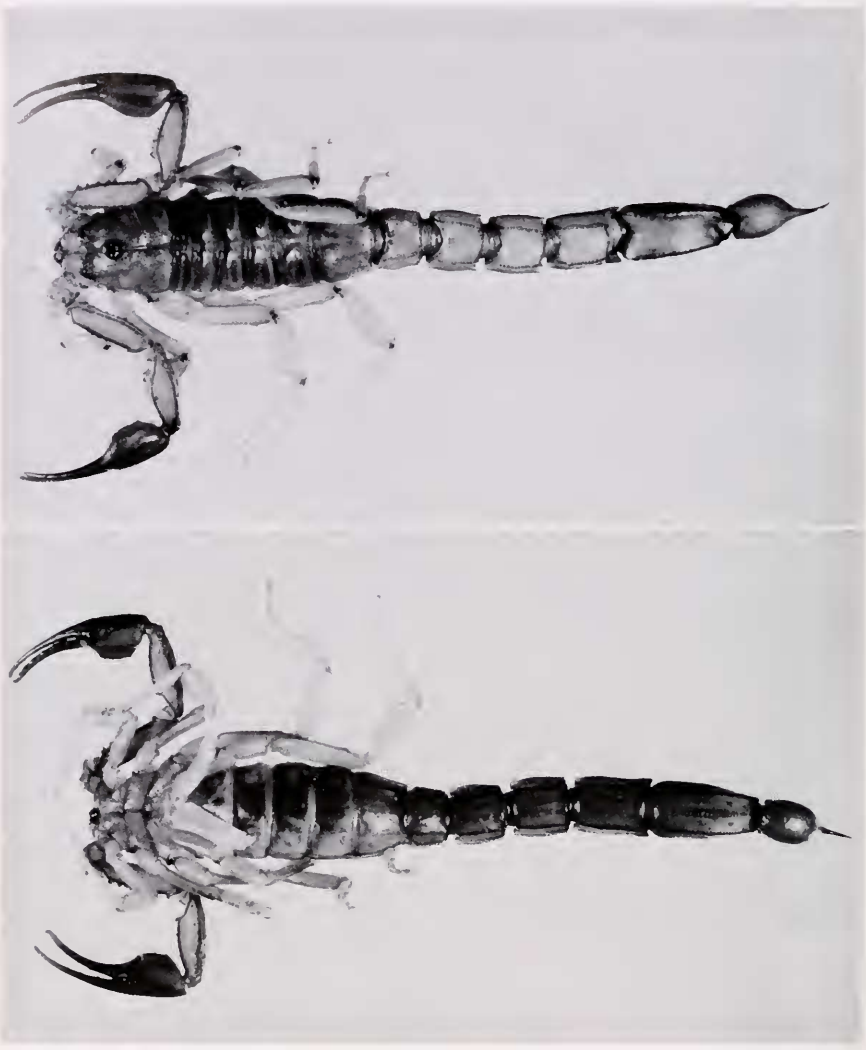

FIGURE 107. *Vaejovis peninsularis*, holotype, male, dorsal and ventral views.

ment III as wide as long or slightly wider, segment IV longer than wide; ventromedian and ventrolateral keels of segments II–IV crenulate. Pectine teeth 15 in females.

Similar to *Vaejovis baueri* but differs as follows: ratio of total metasomal length to width of segment V 5.0 or greater; brachium as long as or longer than carapace (not slightly shorter); metasomal segment IV distinctly longer than wide.

DESCRIPTION OF HOLOTYPE.—**Female.** Coloration: base color of cuticle golden-yellow; pedipalp fingers similar to palm in coloration; pectines whitish. Carapace frontal margin truncated with moderately deep median emargination; 3 pairs lateral ocelli; carapace surface densely granular. Metasoma with dorsolateral keels well developed and crenulate on segments I–IV; ventrolateral keels distinct and crenulate on segments I–V; ventromedian keels reduced and smooth to crenular on segment I, smooth to crenular on II, crenular on III–V; segment IV expanded posteriorly and laterally, wider than segment III. Telson vesicle smooth; broad subaculear tubercule. Pedipalp with fingers terminating distally in an elongate tooth on fixed fin-

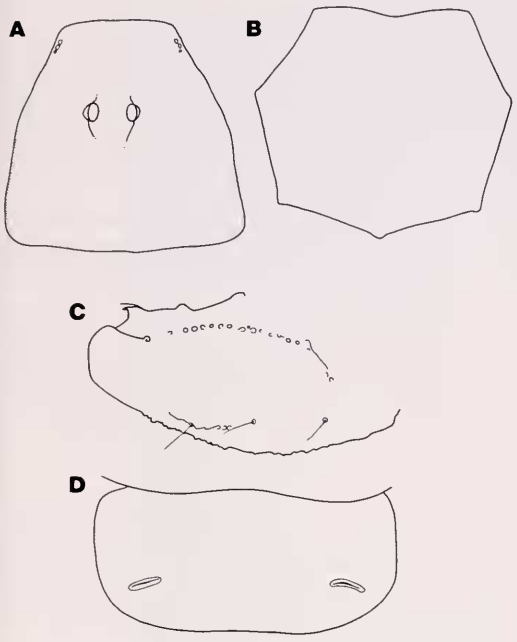

FIGURE 108. Structural characteristics of the genera *Vejovoidus* and *Syntropis*. (*A.*) Carapace of *V. longiunguis*. (*B.*) Cross-sectional view of metasomal segment III showing single unpaired, ventromedian keel (figured from *S. macrura*). (*C.*) Ventral view of brachium of *V. longiunguis* showing trichobothria. (*D.*) Mesosomal sternum of *V. longiunguis* showing stigma.

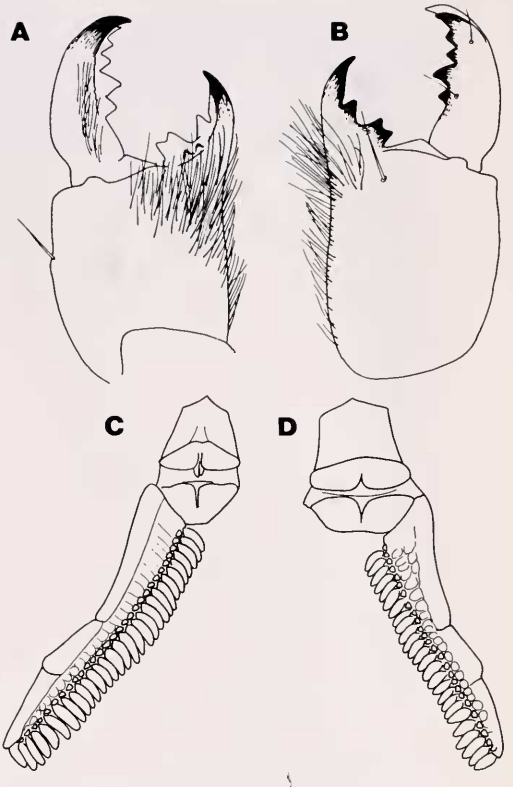

FIGURE 109. Structural characteristics of genus *Vejovoidus*. (*A.*) Ventral view of chelicera. (*B.*) Dorsal view of chelicera. (*C.*) Male pectine, genital operculum, genital papillae, and prosomal sternum. (*D.*) Female pectine, genital operculum, and prosomal sternum.

ger, length of this tooth approximates finger depth at first supernumerary granule, terminal tooth approximately 5 times longer than length of first supernumerary granule; fixed finger with trichobothria *id* and *ip* proximal to supernumerary granule 6; palm with keels raised, these smooth laterally, slightly granular dorsally, more granular medially; fingers with very slight proximal scallop, fingers do not contact along entire length when chela closed.

VARIATION WITHIN PARATYPES.—Similar to holotype except as follows: fixed pedipalp finger with trichobothrium *id* directly above proximal supernumerary granule, or slightly distal (not slightly proximal); metasoma more hirsute; female from Bahía San Bartolomé with ventromedian keels of metasomal segment I smooth to obsolete; female pectine teeth 15–17; total length ranged 33–36 mm.

TYPE DATA.—*Vaejovis pacificus*, holotype (female): CAS, Type No. 12120; Isla Cedros, Baja California Norte, Mexico, 13–17, 19–21–IV–1963, R. C. Banks.

DISTRIBUTION.—Vizcaíno Desert and Isla Cedros.

RECORDS.—Paratypes studied from the following localities in **Baja California Sur, Mexico:** Bahia San Bartolomé, 12–III–1953 (Firstman, Orca Expedition), 1 female (AMNH); Isla Cedros (no other data given).

Vaejovis peninsularis Williams, new species
(Figures 53*B*, 54*A*, 100, 107; Tables 1, 2)

DIAGNOSIS.—Adults to 49 mm long. Base color of body yellowish brown; pedipalp fingers more reddish than palm. Pedipalp with long slender fingers, ratio of movable-finger length to carapace length 1.0–1.2; ratio of chela length to palm width about 3.8–5.0; ratio of movable-finger length to palm width about 2.6–3.2; fixed finger with 6 supernumerary granules; adults with about 60–80 primary-row denticles on fixed finger, these subdivided into 6 distinct subrows by enlarged denticles. Metasoma with segment

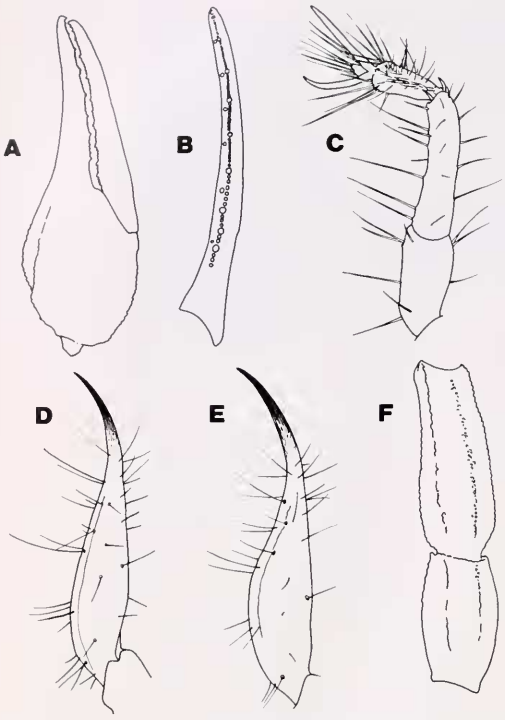

FIGURE 110. Structural characteristics of genus *Vejovoidus*. (*A.*) Pedipalp chela, lateral view. (*B.*) Pedipalp movable finger. (*C.*) Distal end of walking leg, ventral view. (*D.*) Male telson. (*E.*) Female telson. (*F.*) Ventrolateral view of metasomal segments III and IV showing unpaired, single, ventromedian keel.

II wider than long; segment III as wide as long or slightly wider, segment IV longer than wide; segment V with ratio of length to width about 1.7–1.9. Pectine teeth 20–22 in males, 17–18 in females.

Similar to *Vaejovis janssi* but differs as follows: metasomal segment III as wide as or wider than long (not distinctly longer than wide); metasomal segment V with ratio of length to width less than 2.0 (not greater than 2.0).

DESCRIPTION OF HOLOTYPE.—**Male.** Coloration: base color of entire body yellowish brown to coffee; metasomal segment V slightly reddish; pedipalp fingers more reddish than palm. Carapace anterior margin with median emargination; carapace surface granular. Metasoma with ventrolateral keels smooth to crenulate on segments I–IV; ventromedian keels smooth to obsolete on segments I–IV. Telson with ventral surface of vesicle covered with broad obsolescent granules and about 6 pairs long inconspicuous hairs; small subaculear tubercule. Pedipalp palm slightly swollen, fingers elongate; palm keels smooth to obsolete dorsally and laterally, keels granular medially; fingers terminate in elongate denticle distally; fingers with subtle scallop proximally, small space remaining proximally when chela closed.

DESCRIPTION OF ALLOTYPE.—**Female.** Similar to holotype but differs as follows: slightly larger in most body dimensions; lacks subtle scallop on pedipalp fingers.

TYPE DATA.—*Vaejovis peninsularis*, holotype (male), allotype: CAS, Type No. 12121; 13 km N San Raymundo, Baja California Sur, Mexico, 30–VI–1968, S. C. Williams, M. A. Cazier.

DISTRIBUTION.—San Ignacio south to La Purísima.

RECORDS.—Paratypes studied from the following localities in **Baja California Sur, Mexico:** 8 km N San Ignacio (Misión), 20–I–1965 (Roth, AMNH); San Ignacio Misión, 21–25–I–1965 (Roth, AMNH); 13 km NW San Raymundo, 30–VI–1968 (Williams, Cazier); 5.6 km NE San Ysidro, 4–III–1961 (CM).

Genus **Vejovoidus** Stahnke

Vejovoidus is distinguished from other genera in Baja California as follows: fixed pedipalp finger much shorter than carapace length; fixed pedipalp finger with 8 supernumerary denticles flanking primary-row denticles only on prolateral side; metasoma with single, unpaired ventromedian keel on segments III and IV; pedipalp finger with primary-row denticles in single continuous row; 3 lateral ocelli at each anteriolateral corner of carapace; 2 pedal spurs at origin of last tarsal segment on walking legs; prosomal sternum pentagonal.

Vejovoidus is monotypic and endemic to the Vizcaíno Desert.

Vejovoidus longiunguis (Williams)

(Figures 50, 108(*A, C, D*), 109–111)

Syntropis longiunguis WILLIAMS, 1969:285–291.
Vejovoidus longiunguis (Williams). STAHNKE 1974a:120–122.

DIAGNOSIS.—Adults to 60 mm long; carapace, mesosoma, metasoma, and pedipalps uniform pale yellow, lacking contrasting dark or dusky markings; fixed finger of pedipalp distinctly shorter than carapace length; telson with narrow, posteriorly tapering vesicle, conspicuously elongate aculeus; walking legs with distal tarsomere densely hirsute; ventral border of fixed cheliceral finger with several minute denticles; pretarsal claws very elongate, outer claw of each

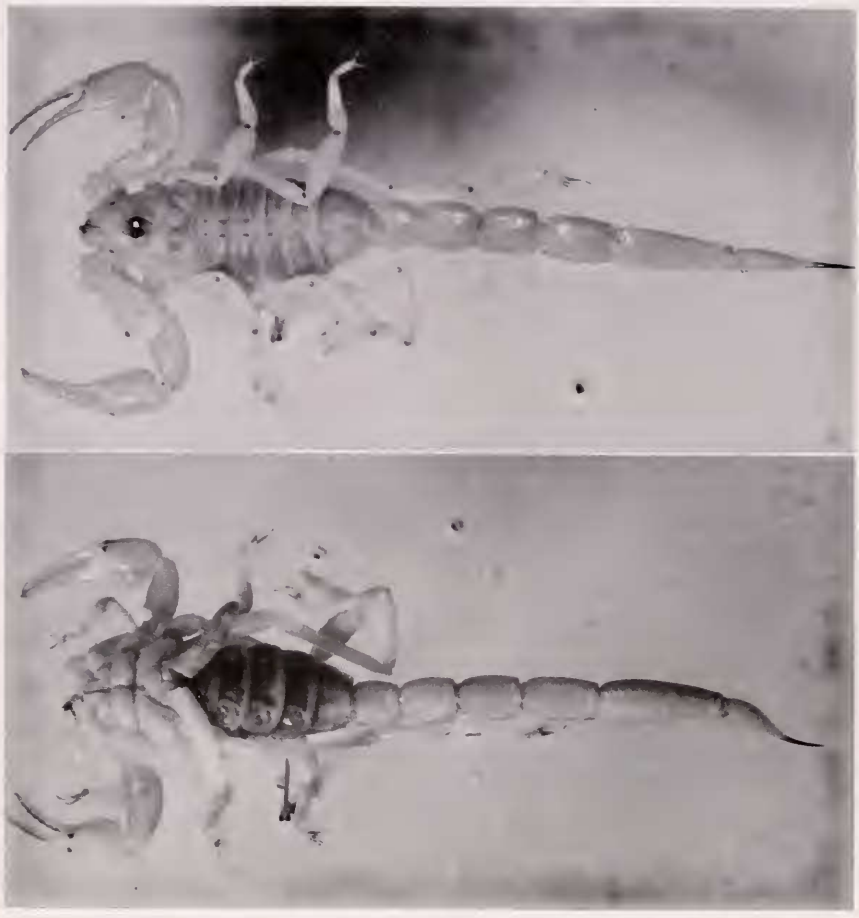

FIGURE 111. *Vejovoidus longiunguis*, holotype, male, dorsal and ventral views.

pair distinctly longer; metasoma with ventromedian keels absent on segments I and II, these smooth to obsolete on III, smooth to crenulate on IV, irregularly serrate on V and not extending to posterior margin of segment; ventrolateral keels of metasoma complete on all segments, irregularly crenulate on I–III, irregularly serrate on IV and V; pectine teeth 24–31 in females, 28–35 in males.

TYPE DATA.—*Syntropis longiunguis*, holotype (male), allotype: CAS, Type No. 10409; San Ángel, 21 km W San Ignacio, Baja California Sur, Mexico, 27–VI–1968, S. C. Williams, M. A. Cazier.

DISTRIBUTION.—Vizcaíno Desert, from Miller's Landing to Rancho Tablón.

NEW RECORDS.—**Baja California Norte, Mexico:** 22.5 km S Guerrero Negro, 16–IV–1969 (Williams); 1.6 km E Las Bombas, 16–IV–1969 (Williams); 3.2 km E Las Bombas, 16–IV–1969 (Williams).

DISCUSSION AND CONCLUSIONS

TAXONOMIC DIVERSITY.—Of the scorpion taxa recognized today throughout the world, 4 of the 6 families, 11 of the 128 genera (9%), and 61 of the 1,437 species (4%) occur in Baja California (Table 3). These figures are remarkable in that Baja California is only about 1,300 km long and has an average width of about 100 km. The Vaejovidae is especially well represented with 8 of the 16 recognized genera (50%) and 55 of the 155 recognized species (35%) (Table 3). Only two families, the Bothriuridae and Scorpionidae, are unrepresented in the area.

The most diverse scorpion faunas of North America are those of Baja California and the

TABLE 3. COMPARISON OF NUMBERS OF GENERA AND SPECIES OF SCORPIONS IN BAJA CALIFORNIA WITH WORLD-WIDE ESTIMATES (*modified from Stahnke, 1974b).

	WORLD-WIDE ESTIMATE*		BAJA CALIFORNIA		% BAJA CALIFORNIA	
FAMILY	GENERA	SPECIES	GENERA	SPECIES	GENERA	SPECIES
Bothriuridae	9	86	0	0	0	0
Buthidae	44	592	1	1	2	0.2
Chactidae	21	140	1	1	5	0.7
Diplocentridae	6	39	1	4	17	10
Scorpionidae	31	425	0	0	0	0
Vaejovidae	16	155	8	55	50	35
TOTALS:	127	1437	11	61	9	4

western United States where comparable numbers of families, genera, and species are found. The fauna of mainland Mexico is next with slightly fewer species, but with similar numbers of families and genera (Table 4). The least diverse fauna in North America is that of the eastern United States (east of the Mississippi River) where substantially fewer families, genera, and species are represented.

The richness of the Baja California fauna can further be appreciated by comparison with the scorpions of California—California having only

TABLE 4. REGIONAL AFFINITIES OF NORTH AMERICAN SCORPION TAXA. Genera endemic to Baja California noted with an asterisk (*).

	NUMBER OF SPECIES KNOWN				
	Baja California	California	Mainland Mexico	Western U.S.A.	Eastern U.S.A.
BUTHIDAE					
Centruroides	1	1	18	3	4
Isometrus	–	–	–	–	1
Tityus	–	–	1	–	1
CHACTIDAE					
Megacormus	–	–	2	–	–
Plesiochactas	–	–	1	–	–
Superstitionia	1	1	–	1	–
Typhlochactas	–	–	2	–	–
DIPLOCENTRIDAE					
Didymocentrus	4	–	–	–	–
Diplocentrus	–	–	3	3	–
VAEJOVIDAE					
Anuroctonus	1	1	–	1	–
Hadrurus	5	3	2	3	–
**Nullibrotheas*	1	–	–	–	–
**Paravaejovis*	1	–	–	–	–
Paruroctonus	9	14	5	15	–
**Syntropis*	1	–	–	–	–
Uroctonus	–	1	–	1	–
Vaejovis	36	19	19	31	1
**Vejovoidus*	1	–	–	–	–
TOTALS:					
families	4	3	4	4	2
genera	11	7	9	8	4
species	61	40	53	58	7

about 65 percent as many species and 64 percent as many genera (Table 4).

Taxonomic Diversity of Geographic Subregions of Baja California.—One explanation for the diversity of scorpions in Baja California is that the peninsula and associated islands have experienced a complex origin and subsequent history. The peninsula is believed to have arisen by gradual cleavage from western mainland Mexico, followed by a northwesterly movement of the peninsula to its present location. After peninsular separation, dramatic changes in relative sea level resulted in periods of extensive island formation, expansion of the terrestrial environment, periods of extensive island submergence, and flooding of terrestrial habitats. Volcanic activity was extensive at other times. These profound geological disruptions provided diverse habitats for occupation by scorpions at different times during the history of the peninsula. Today there are extensive habitats with marine sedimentary soils, volcanic habitats, granitic habitats, and habitats created by secondary wind deposition. There are conifer- and chaparral-covered mountains, desert basins, chaparral-covered foothills, stabilized and unstabilized sand dunes, salt flats, cactus and idria forests, desert oases, desert scrub associations, tropical thorn forests, and a multitude of islands, all reflecting a great array of environmental conditions. The Cape region, Sierra San Pedro Mártir, and Sierra Juárez represent very old land forms and have probably served as important refugia during times of dramatic changes in climate and available terrestrial habitat. The Magdalena Plain, and the Vizcaíno and Colorado deserts represent some of the most recently formed terrestrial habitats in North America today.

Eight biotic provinces are generally recognized in Baja California based on similarities in terrain, ecology, and distributions of the biota. These provinces are: (1) Californian (extension of southern California coast and foothills); (2) Vancouveran (extension of peninsular ranges of southern California); (3) Colorado Desert (extension of Colorado Desert of southern California); (4) Vizcaíno Desert (unique midpeninsula desert); (5) Volcanic range (rugged zone of midpeninsula volcanic terrain); (6) Magdalena Plain (extensive flat, sedimentary region on western edge of peninsula); (7) Cape (extending from La Paz to Cabo San Lucas); and (8) Island (islands associated with peninsula in the Gulf of California and Pacific Ocean).

The terrain of each province is more or less heterogeneous and there is usually a number of different biotic communities within each province. Many species belong to more than one community association and a number are found in more than one biotic province. A few species are relatively specific in habitat preferences and thus are more restricted in distribution.

In numbers of species, the richest provinces are the Island, with 33 species, and the Volcanic, with 25 species. Provinces with the least species are the Vancouveran and Magdalena Plain, with 6 and 10 species, respectively. Other provinces show intermediate diversity (Table 5).

In numbers of genera, the Volcanic province has the most with 9 genera, followed by the insular with 8, and the Cape and Vizcaíno Desert each with 6. The region with fewest genera is the Colorado Desert with 4 genera. Other provinces are intermediate in generic diversity (Table 5).

In general, scorpions are most diverse on the islands, when the island fauna is viewed collectively. Any one island, however, is generally similar to the adjacent region of the peninsula in numbers and kinds of genera and families, and has about equivalent numbers of species or slightly fewer species. The scorpion faunas of individual islands are found to vary substantially from each other in general abundance of scorpions and numbers of species present. Most islands have an abundance of scorpions, with *Centruroides exilicauda* being one of the most frequently encountered species. Most islands have from 4 to 6 species represented. Ten species were endemic to the Island Province.

Origin and Phylogenetic Affinities of the Baja California Scorpion Fauna.—The Baja California scorpion fauna appears to have a complex origin. There is evidence of a very old faunal element that probably was present in Baja California before its separation from the Mexican mainland approximately four to six million years ago. This archaic element is represented by the four monotypic and endemic genera, *Nullibrotheas*, *Paravaejovis*, *Syntropis*, and *Vejovoidus*. Species that do not appear to have close relatives within their genus probably represent old stock. Such species include *Hadrurus hirsutus* (restricted to the Cape Province), *Paruroctonus pseudopumilis* (restricted to the

TABLE 5. SCORPIONS FROM BAJA CALIFORNIA, MEXICO, AND ASSOCIATED ISLANDS SHOWING SUBREGIONAL AFFINITIES. Taxa endemic to Baja California are noted with an asterisk (*). Frequency of encounters indicated as follows: 1—frequently encountered; 2—commonly encountered; 3—rarely encountered; ––not encountered.

	Biogeographic Province							
Species	Island	Californian	Vancouveran	Colorado Desert	Vizcaíno Desert	Volcanic Province	Magdalena Plain	Cape
BUTHIDAE								
Centruroides exilicauda	1	1	–	–	1	1	1	1
CHACTIDAE								
Superstitionia donensis	3	2	2	3	3	3	–	3
DIPLOCENTRIDAE								
Didymocentrus								
**caboensis*	–	–	–	–	–	–	–	2
**cerralvensis*	2	–	–	–	–	–	–	–
**comondae*	2	–	–	–	–	3	–	2
**cruzensis*	3	–	–	–	–	–	–	–
VAEJOVIDAE								
Anuroctonus phaiodactylus	–	1	1	–	–	–	–	–
Hadrurus								
arizonensis pallidus	2	–	–	1	–	–	–	–
**austrinus*	–	–	–	–	2	–	–	–
**concolorous*	1	–	–	–	1	1	2	2
**hirsutus*	–	–	–	–	–	–	–	1
obscurus	–	–	–	2	–	–	–	–
**pinteri*	2	–	–	–	–	2	–	–
**Nullibrotheas*								
**allenii*	1	–	–	–	–	2	2	2
**Paravaejovis*								
**pumilis*	–	–	–	–	–	3	1	–
Paruroctonus								
**arnaudi*	–	2	–	–	–	–	–	–
borregoensis	–	–	–	3	–	–	–	–
**grandis*	2	–	–	1	–	2	–	–
luteolus	–	–	–	3	–	–	–	–
mesaensis	–	–	–	1	–	–	–	–
**pseudopumilis*	–	–	–	–	3	–	–	–
silvestrii	2	1	1	–	–	–	–	–
**surensis*	–	–	–	–	3	–	–	–
**ventosus*	–	3	–	–	–	–	–	–
**Syntropis*								
**macrura*	3	–	–	–	–	3	–	–
Vaejovis								
**adcocki*	3	–	–	–	–	–	–	–
andreas	–	2	3	–	–	–	–	–
**armadentis*	3	–	–	–	–	–	–	–
**baueri*	2	–	–	–	–	–	–	–
**bechteli*	3	–	–	–	–	–	–	–
**bruneus*								
**bruneus*	–	–	–	–	–	1	–	–
**loretoensis*	3	–	–	–	–	2	–	–
**villosus*	2	–	–	–	–	2	–	–

Table 5. Continued.

Species	Biogeographic Province							
	Island	Californian	Vancouveran	Colorado Desert	Vizcaíno Desert	Volcanic Province	Magdalena Plain	Cape
confusus	–	–	–	3	–	–	–	–
**diazi*								
**diazi*	2	–	–	–	3	2	1	2
**transmontanus*	3	–	–	–	–	2	–	–
**dwyeri*	3	–	–	–	–	–	–	–
**eusthenura*	–	–	–	–	–	–	–	1
**galbus*	–	–	–	–	–	3	3	–
gertschi	2	1	2	–	3	3	–	–
**gigantaensis*	–	–	–	–	–	3	–	–
**gravicaudus*	1	–	–	–	–	1	–	–
**haradoni*	3	–	–	–	–	2	2	2
**harbisoni*	2	–	–	3	–	–	–	–
**hearnei*	–	–	–	–	–	3	–	–
hirsuticauda	2	3	–	2	3	3	–	–
**hoffmanni*								
**fuscus*	–	–	–	–	–	2	–	–
**hoffmanni*	–	–	–	–	1	–	–	–
**insularis*	2	–	–	–	–	–	–	–
**janssi*	1	–	–	–	–	–	–	–
**lindsayi*	–	–	–	–	–	–	–	3
**littoralis*	2	–	–	–	–	–	–	–
**magdalensis*	–	–	–	–	–	–	1	3
**minutis*	2	–	–	–	–	3	–	1
**montcazieri*	–	–	–	–	–	2	–	–
**pacificus*	2	–	–	–	2	–	–	–
**pattersoni*	–	–	–	–	–	–	–	2
**peninsularis*	–	–	–	–	2	2	–	–
**punctipalpi*								
**barbatus*	1	–	–	–	–	–	2	1
**cerralvensis*	2	–	–	–	–	–	–	–
**punctipalpi*	–	–	–	–	–	–	–	1
puritanus	2	1	1	3	1	2	–	–
**rufulus*	–	3	–	–	–	–	–	–
spinigerus	2	–	–	2	–	–	–	–
**viscainensis*	–	–	–	–	2	3	–	–
**vittatus*	2	–	–	–	–	1	2	1
**waeringi*	–	–	–	1	–	–	–	–
**Vejovoidus*								
**longiunguis*	–	–	–	–	1	–	–	–

	All subregions								
Totals: families:	4	4	3	2	1	3	4	2	4
genera:	11	8	5	4	4	6	9	5	6
species:	61	33	11	6	13	15	25	10	15
subspecies:	12	7	0	0	1	3	6	2	3

Vizcaíno Desert), and *Vaejovis viscainensis* (restricted to the Vizcaíno Desert). A second important faunal element is derived from a northern invasion of the peninsula in more recent times. Such invasions are believed to have occurred in several periodic migrations correlated with climatic and sea-level changes during the Pliocene and Pleistocene. Most of these recent invaders are distributed in the more northerly regions of the peninsula, and they generally have fairly broad distributions that extend north into the southwestern United States. Some examples include *Vaejovis spinigerus*, *V. gertschi*, *Superstitionia donensis*, *Paruroctonus borregoensis*, *P. luteolus*, *P. mesaensis*, *P. silvestrii*, *Hadrurus arizonensis*, *H. obscurus*, and *Anuroctonus*

TABLE 6. GEOGRAPHIC AFFINITIES OF NONENDEMIC BAJA CALIFORNIA SCORPIONS. (× indicates presence of species in a given region.)

SPECIES	SOUTHERN CALIFORNIA COAST AND FOOTHILLS	SOUTHERN CALIFORNIA MOUNTAINS	SOUTHERN CALIFORNIA DESERT	SONORAN DESERT
Anuroctonus phaiodactylus	×	×		
Centruroides exilicauda			×	×
Hadrurus arizonensis			×	×
Hadrurus obscurus			×	
Paruroctonus borregoensis			×	
Paruroctonus luteolus			×	
Paruroctonus mesaensis			×	×
Paruroctonus silvestrii	×	×		
Superstitionia donensis	×		×	
Vaejovis andreas	×			
Vaejovis confusus			×	×
Vaejovis gertschi	×			
Vaejovis hirsuticauda			×	×
Vaejovis puritanus	×	×		
Vaejovis spinigerus			×	×

phaiodactylus. Invasions by these species have probably been recent, judging from morphological similarity among populations and their generally continuous distributions. The minimus subgroup of *Vaejovis* possibly represents a very old invasion, perhaps from the north. There are currently four species recognized in this subgroup in Baja California, and they are distributed in disjunct patterns from the Cape Province to southern California. Within Baja California their populations appear small, their distribution restricted, and the species generally allopatric. This group was perhaps widely distributed throughout the peninsula in the past, but today it is withdrawn into small endemic foci except for *Vaejovis andreas* which has a broad distribution extending into coastal and foothill habitats of southern California. A third group of species appears to have originated solely within Baja California since it separated from the mainland of Mexico. This group is represented by members of the wupatkiensis, eusthenura, and punctipalpi subgroups of *Vaejovis*. Both the eusthenura and punctipalpi subgroups form a series of closely related allopatric species that replace each other along a north-to-south progression. They are composed of a number of endemic species that appear to have speciated within Baja California from ancestral stock that occurred widely throughout the peninsula. The wupatkiensis subgroup of *Vaejovis* is unique in that it appears to be undergoing significant speciation. It is the only subgroup that has a substantial number of species limited to the shallow-

TABLE 7. TAXONOMIC DIVERSITY AND ENDEMISM OF BAJA CALIFORNIA SCORPIONS BY BIOGEOGRAPHIC PROVINCE.

BIOGEOGRAPHIC PROVINCE	NUMBER TAXA PRESENT (NUMBER TAXA ENDEMIC) % ENDEMISM			
	FAMILIES	GENERA	SPECIES	SUBSPECIES
Californian	3(0)0	5(0)0	11(3)27	0(0)0
Vancouveran	2(0)0	4(0)0	6(0)0	0(0)0
Colorado Desert	1(0)0	3(0)0	13(4)31	2(1)50
Vizcaíno Desert	3(0)0	6(2)33	15(9)60	2(2)100
Volcanic Province	4(0)0	9(3)33	25(20)80	5(5)100
Magdalena Plain	2(0)0	5(3)60	10(9)90	1(1)100
Cape	4(0)0	6(2)33	15(13)87	5(5)100
Islands	4(0)0	8(2)25	33(25)76	7(7)100
TOTAL (Baja California and Islands)	4(0)0	11(4)36	61(46)75	12(11)92

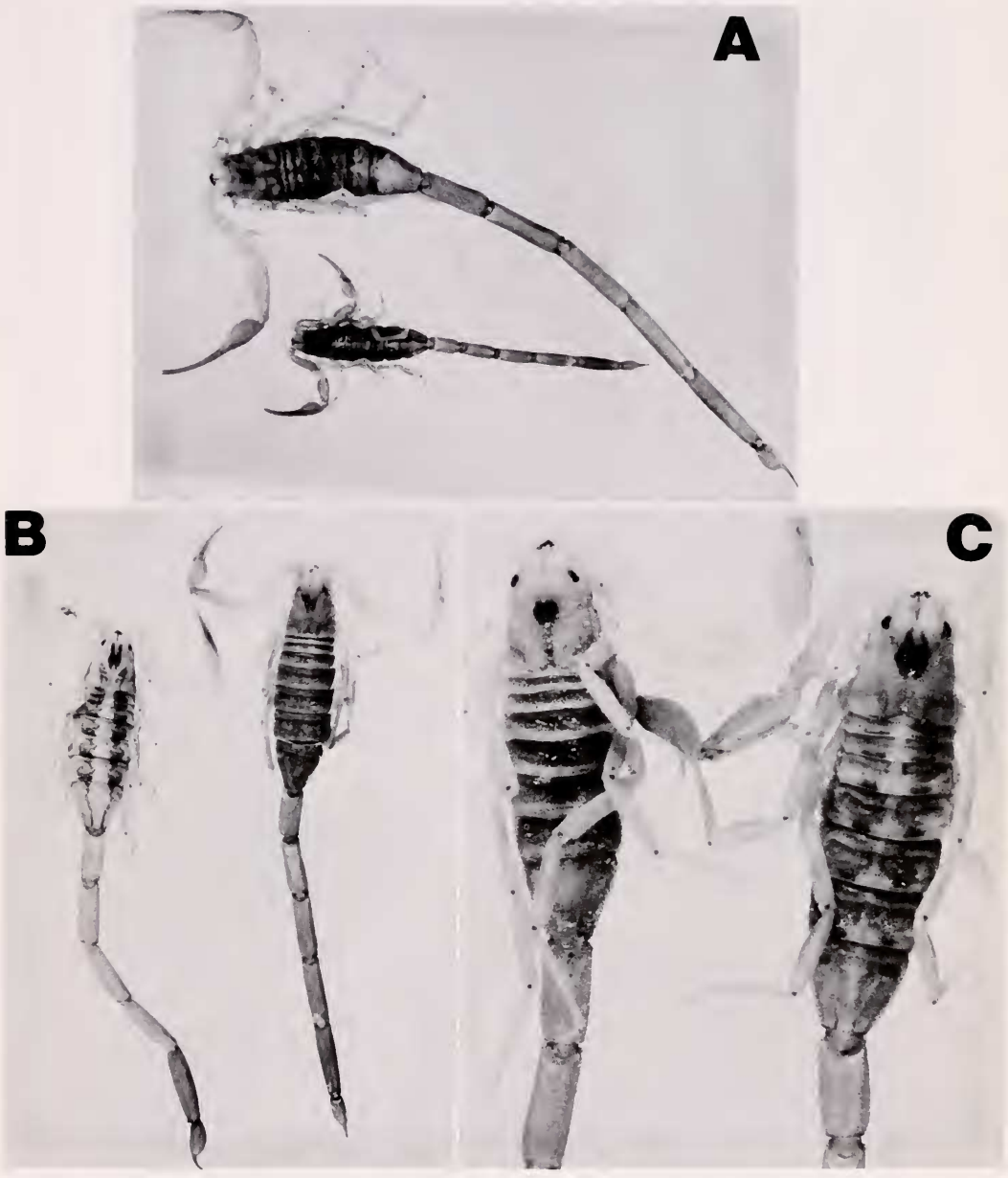

FIGURE 112. Intraspecific variability of *Centruroides exilicauda*. (*A*.) Adult male from Isla Espíritu Santo (above) contrasted with adult male from La Paz on the adjacent peninsula to show gigantism. (*B*.) Color dimorphism in northern populations: male from near Rodeo, New Mexico (striped phase) is contrasted with adult male from near Tempe, Arizona (concolorous phase). (*C*.) Color dimorphism in southern populations is demonstrated by contrasting two adult males collected together at Cabo San Lucas; concolorous phase on left, striped phase on right.

water islands associated with the peninsula. Such speciation must be fairly recent since it is believed these islands have not long been isolated from the peninsula.

ZOOGEOGRAPHICAL AFFINITIES OF THE BAJA CALIFORNIA SPECIES.—Of the 61 species of scorpions in Baja California, 15 (25%) are also known from outside Baja California. These 15

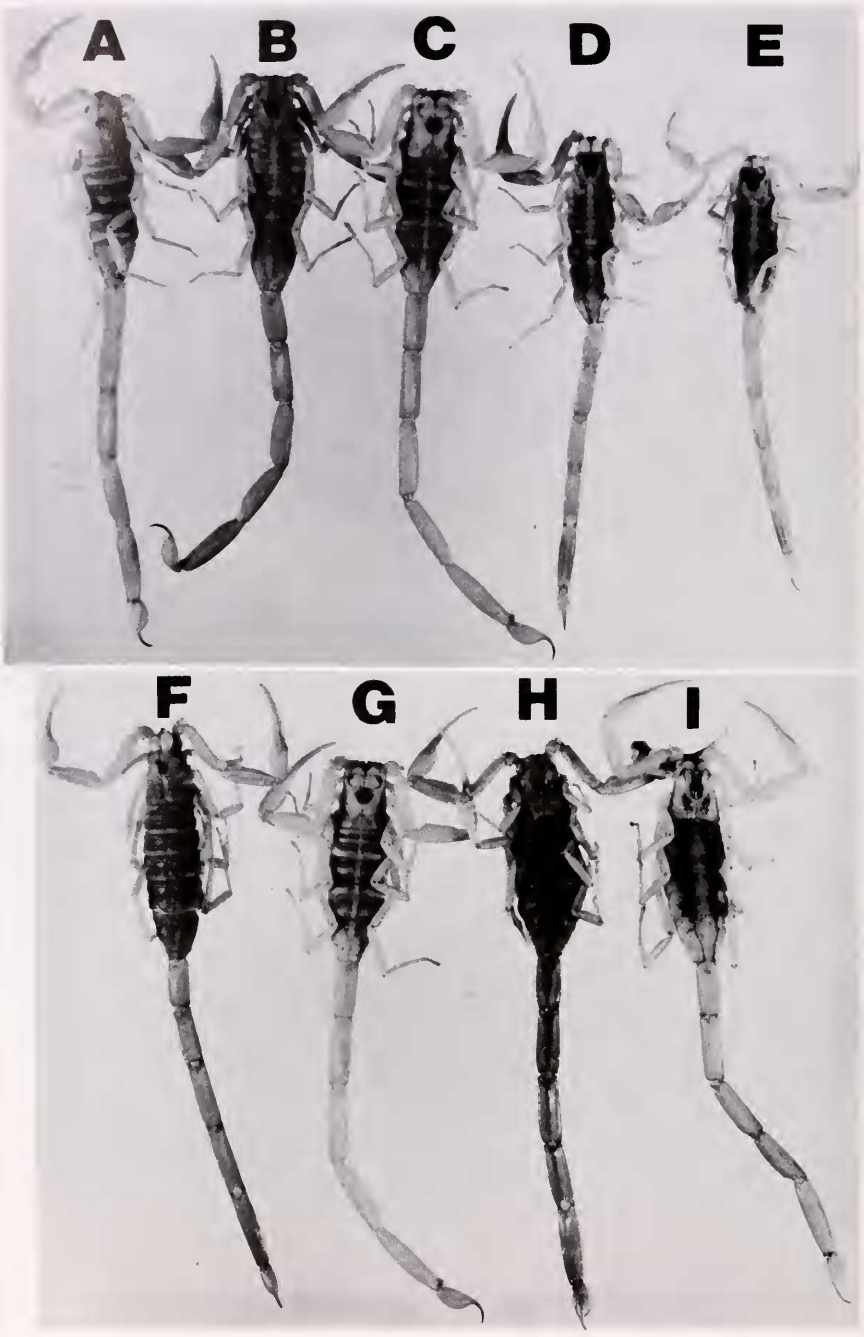

FIGURE 113. Geographic variability of *Centruroides exilicauda* (adult males). (*A.*) Cabo San Lucas, Baja California. (*B.*) Cabo San Lucas, Baja California. (*C.*) Bahía de los Ángeles, Baja California. (*D.*) La Paz, Baja California. (*E.*) Punta Banda, Baja California. (*F.*) Granite Reef Dam, Maricopa County, Arizona. (*G.*) Bahía de los Ángeles, Baja California. (*H.*) Puerto Peñasco, Sonora. (*I.*) Rodeo, New Mexico.

species show geographical affinities with the following four regions: southern California coast and foothills, southern California peninsular ranges, Colorado Desert, and the Sonoran Desert. The closest affinity is with the Colorado Desert (10 species in common), followed by the southern California coast and foothills and the Sonoran Desert (6 species each in common). The least affinity is with the California peninsular ranges with three species in common (Table 6).

ENDEMISM.—Of the 61 species of scorpions found in Baja California, 46 (75%) are endemic. The greatest numbers of endemic species occur in the Island Province (25), the Volcanic Province (20), and the Cape Province (13). The only region without endemic species is the Vancouveran Province; all others have at least three endemic species (Table 7).

Four of the 11 scorpion genera in Baja California (37%) are endemic. These are distributed in the southern regions of Baja California and on the associated islands. No endemic genera are found in northern regions of the peninsula.

EVALUATION OF TAXONOMIC CHARACTERS.—The status of many traditionally used taxonomic characters was evaluated. Many characters had little diagnostic value as previously used. For example, characters such as coloration, total body size, proportions of body parts, and hirsuteness often only reflect a level of variation related to local race formation. Species such as *Paruroctonus grandis, Vaejovis hoffmanni, V. diazi, V. bruneus,* and *Centruroides exilicauda* (Fig. 112*B, C*) are generally darker when taken from habitats with dark substrata and lighter when taken from habitats with light ones. Some species show spectacular differences in body size when mature individuals from different subpopulations are compared. For example, mature individuals of *Centruroides exilicauda* from the La Paz region are characteristically very small in size, but approximately 24 km away, at Balandra Cove, they are 50 to 75 percent larger (Figs. 112*A*, 113). Gigantism in this species also occurs on the island of Espíritu Santo. Similar expressions of gigantism are seen among species of *Vaejovis* and in *Nullibrotheas allenii.* These size variations are probably best explained by differences in prey availability in various habitats. The most conspicuous gigantism was observed in habitats with regular prevailing winds from the sea.

I also studied the variability of ratios between specified body parts. Generally, within any given population a modest range of variation is observed. This variation is due partly to individual, age, and sexual differences, and to measurement error. Scorpion specialists have used such ratios in their diagnoses and keys, but few have expressed normal ranges of expected variation. They have, instead, usually given absolute values, these often based on the measurement of a single specimen. Ratio variability furthermore often increases when one includes populations from extreme parts of the range. Some species show substantial interpopulation variation in ratios. In the case of *Vaejovis puritanus,* the length-to-width proportions of the pedipalp chela and the length-to-width ratios of the metasomal segments show gradual change from north to south. *Centruroides exilicauda* shows so much interpopulation variability that ratios are not generally reliable indicators of species affinity. In this species, comparison of ratios from extreme subpopulations would lead one to conclude the presence of more than one species (Walker 1973).

It appears that few scorpion taxa remain undiscovered in Baja California. Those that are will probably come from the still-unaccessible regions and from the yet-unsampled islands. New taxa will probably mainly belong to the wupatkiensis and minimus subgroups of *Vaejovis.* The species and generic diversity is remarkable, but it will be impossible to fully appreciate and interpret the Baja California scorpion fauna until our knowledge of the faunas of western mainland Mexico and the southwestern part of the United States is more complete.

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